

## AFRICAN DIPLOPODA OF THE FAMILY GOMPHODESMIDÆ.

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*Custodian of Myriapoda.*

The Gomphodesmidæ constitute a clearly defined and homogeneous group. They are apparently the dominant Merocheta of tropical East Africa, with reference both to individuals and species, the Oxydesmidæ being their only rivals. The Gomphodesmidæ are clearly a more specialized group than the Oxydesmidæ and, indeed, present several characters unique in the order. The first six legs of males, for instance, are provided at the end of the last joint with a fleshy pad or sole, present in all known species. In several genera the number of olfactory cones of the last antennal joint is 10, while 4 is the normal and constant number for all other known Merocheta. In some forms segment 15 bears in males a subtriangular process from between the anterior pair of legs; such a modification of the sternum of a single segment of the posterior part of the body is elsewhere unknown in the Diplopoda. Several other equally peculiar but not entirely unparalleled secondary sexual characters are described under the various genera.

In habit the Gomphodesmidæ are also strikingly distinct from all African Merocheta, the salient features being a robust and compact body, a strongly convex, unsculptured dorsum, lateral carinae with prominent, thickened, even, and entire lateral margins, the posterior segments greatly shortened, especially segment 18, with the last segment short, broadly triangular, narrowly truncate at apex and without prominent setiferous tubercles. The presence of pores on segments 11 and 14 will also serve as a means of family diagnosis, with the single exception of the genus *Marptodesmus*.

An agreement in pore-formula has led previous writers to refer the members of this family to the genus *Eurydesmus* Saussure,<sup>1</sup> a very imperfectly known genus supposed to come from South America. Probably related Brazilian forms belong to a series which has been

<sup>1</sup>Essai Myr. Mex.—Mem. Soc. Phys. et Hist. Nat. Geneve, 1860, XV, p. 77. The type is *E. angulatus* Saussure, *idem*, p. 78, supposed to be from Brazil.

given the name *Chelodesmidæ*.<sup>1</sup> In *Chelodesmus* there is a laminate process from the distal corner of the ventral side of the penultimate joint of the legs, much after the manner of most *Spirostreptidæ*, and the other secondary characters are equally different from those of the *Gomphodesmidæ*, so that if affinity with the *Chelodesmidæ* may hardly be denied, yet the relationship, if any, is certainly not close, and no forms are known which could be looked upon as connecting links.

#### Family GOMPHODESMIDÆ Cook.

*Gomphodesmidæ* Cook, Ann. N. Y. Acad. Sci., 1895, IX, p. 4; Proc. U. S. Nat. Mus., 1895, XVIII, p. 82.

Body rather small to large, robust, oblong, abruptly narrowed at both ends, about five times as long as broad, the cavity somewhat depressed.

Vertex smooth, moderately and evenly convex, without hairs; sulcus distinct, meeting a subtransverse interantennal sulcus; postantennal depression deep, the supposed sense-organ large.

Labrum slightly emarginate, with three short, blunt teeth.

Antennæ filiform, joints in order of length 2, 4, 5, 6, 1, 7, joints 4-6 more or less subequal; olfactory cones 4 or 10.

Mandibular stipe with exposed surface divided by sutures into five areas, the basal larger than the others taken together.

Hypostoma strongly arcuate; rising from each side of the convex median portion is a flattened oblong process lying against depressions of the lower part of the mentum.

Cardo present, transversely oval.

Mentum broadly triangular, long pointed in front, very broadly emarginate behind, hirsute.

Stipes over twice as long as broad, hirsute; lingual lobes large; median lobe not evident.

First segment subelliptic or subreniform, usually about three times as broad as long.

Segments with dorsal surface nearly or quite smooth, neither granular nor areate. Along the posterior margin of each segment above is a row of very fine and short longitudinal wrinkles or striae, usually very distinct under a lens. They occur on the immediate edge of the tergite, at the base of the supplementary margin.

Lateral carinae moderately or strongly approximate, one-fourth as broad as the body cavity or narrower, inserted from one-half to three-fourths of the height of the body cylinder; lateral margins with a

<sup>1</sup>Proc. N. Y. Acad. Sci., 1895, IX, p. 4. According to Saussure, his genus has the characters of *Fontaria* with the exception of the pore-formula. The South American forms known to me have not the spine of the second joint of the legs, the most characteristic feature of the *Xystodesmidæ*, though the habit is not strikingly different. Saussure's statement, however, led me to include *Eurydesmus* in the same family with *Fontaria*, but I now strongly suspect that it is in reality not widely different from *Chelodesmus*.

distinct, prominent callus, the edge blunt, entire; carinæ of anterior segments curved slightly forward; those of the posterior turned more strongly backward and their posterior corners increasingly produced caudad, usually sharp and dentiform on segments 17 to 19.

Repugnatorial pores small, dorsal or sublateral, located in a usually distinct cavity near the middle of the marginal calli of segments 5, 7, 9 to 19, with the single exception of the genus *Marptodesmus*, which lacks pores on segments 11 and 14.

Below the carinæ the segments are smooth or finely rugulose, with a small secondary carina above the insertion of the legs.

Anterior subsegments smooth or very minutely striolate longitudinally under a lens.

Supplementary margin long, membranous, finely striate longitudinally, not pectinate.

Penultimate segment very short, its small and dentiform carinæ included between and seldom exceeding those of segment 18, which are many times larger.

Last segment very short, triangular, the apex narrow, truncate or somewhat rounded, the entire sclerite bearing 16 setæ, as follows: Two pairs lateral, two pairs marginal, two pairs dorsal, all these rising from small or indistinct tubercles; one pair apical and one subapical, rising from punctations.

Anal valves with compressed, elevated margins and two setigerous tubercles, the upper pair placed on the outer slope of the raised margin, the lower somewhat removed from it.

Preanal scale subtriangular or rounded, usually apiculate, the two setiferous tubercles more or less developed, located rather close together.

Sternal space between the bases of the legs broad, except on anterior and posterior segments; the sterna are variously modified by the presence of secondary sexual characters noted below.

Legs, as compared with other families of the order, rather short and moderately robust.

#### *Secondary sexual characters.*

This family offers a considerable series of constant secondary sexual characters, several of which are, as far as known, entirely unique. In common with most other Merocheta, the females are somewhat more convex and robust than the males, and have shorter and more slender legs. The more peculiar features are as follows:

1. The sterna are in most of the larger genera provided in males with two transverse, medianly interrupted sharp ridges connecting the bases of the legs.

2. Sternum of fifth segment with a pair of small processes located between the bases of the fifth pair of legs: *Harmodesmus*.

3. Sternum of sixth segment with two distinctly separated processes

located between the bases of the sixth pair of legs: *Harmodesmus*, *Marptodesmus*.

4. Sternum of sixth segment with a similarly located very broad, thin and lamellar process divided nearly to base into two semicircular lobes: *Ulodesmus*.

5. The process broader than long, subquadrate, distinctly and broadly excised distally: *Mychodesmus*.

6. The process slender, quadrituberculate distad: *Tycodesmus*.

7. The process is semicircular, subquadrate, or triangular, about as broad as long, medianly more or less apiculate: *Astrodesmus* and all genera not mentioned under the four preceding numbers.

8. The posterior edge of the rim of the aperture in which the copulatory legs are inserted is deeply and broadly emarginate, leaving a pair of prominent laminate processes at the bases of the normal legs of the seventh segment: *Tycodesmus*, *Tymbodesmus*.

9. Transverse ridges between the posterior pair of legs of segment 8 short (narrow) and much more prominent than the others: *Tycodesmus*, *Tymbodesmus*, *Omodesmus*, and in a less degree, *Astrodesmus*.

10. Sternum of segment 15 with a median subtriangular, distally rounded, medianly canaliculate process directed cephalad and ventrad: *Astrodesmus* and all the larger genera except *Gomphodesmus* and *Tycodesmus*; the smallest genera, *Ulodesmus*, *Mychodesmus*, *Neodesmus*, and *Sphenodesmus*, are without such a process.

11. Segment 16 with a small papilliform process located similarly to the process of segment 15 previously described: *Tycodesmus*.

12. Second male legs with coxæ produced (ventrad), most in *Omodesmus*.

13. First 6 pairs of legs of male provided with a fleshy sole at the apex of the last joint; present in all known specimens.

14. The claw is more or less distinctly reduced, being most reduced in genera with crassate legs and large soles.

15. Anterior male legs with joints 4 to 6 more or less tuberculate on the ventral face: *Astrodesmus*, *Marptodesmus*, and probably most of the other genera.

16. Anterior male legs with second joint strongly inflated on the dorsal side; this feature appears in all the genera as far as known.

17. In the genus *Merodesmus* the coxæ of the second legs are greatly produced ventrad and beset with very long hairs.

18. In *Gomphodesmus* the coxæ of the second legs are somewhat produced and on the lateral side are expanded and bear two rounded, flattened processes.

19. In *Gomphodesmus* the ventral part of the third segment of the female is produced into a thin prominent rim, which is deeply and broadly emarginate in the middle to accommodate the second pair of legs.

The copulatory legs of the Gomphodesmidae are constructed on a

plan quite distinct from those of any other family. The second joint is compressed or triquetrous, hairy at base; it is soon narrowed into a strongly compressed chitinous band, which is strongly deltaxed and provided with an irregular knot-like process in the sinus. Distad from this knot the copulatory legs are narrowed into a usually very long and variously curved flagellum. There are two genera, *Marptodesmus* and *Harmodesmus*, which depart strongly from this typical form and have other characters which separate them from the remainder of the group, without, however, connecting them with any other. The remarkable copulatory apparatus just described, together with the unusual number and unique character of the appliances whose function is in all probability to assist in copulation, are perhaps indications of some peculiar biologic condition existing in the present family, and perhaps correlated with the fact that fully seven-eighths of the known specimens are males. The inference would seem to be that in connection with the addition of the numerous accessories there has arisen a preponderance of males such as is not known to exist elsewhere among Diplopoda. As in other families, it has been found possible to separate the genera largely by the use of secondary sexual characters. That these are not meaningless and variable features, as supposed to be the case in some Coleoptera, for instance, appears from the above facts as well as from the constancy of the characters themselves.

It will perhaps appear that the genera have been unduly multiplied, which the future only can demonstrate. At present it seems to me that the species which remain as congeneric are not at all closely related, with one or two exceptions. It is also to be considered that a group obliged to adopt so many devices to make perpetuation possible would be likely to break into distinct subdivisions.

This family is distributed throughout tropical East Africa, and outlying species are known from Caffraria, the Upper Nile region, and from the German colonies of Kamerun and Togo. The Togo material consists of two or three young individuals which have not been described, but they belong without doubt to the present family. A single species, *Tymbodesmus figlinus*, from Kamerun, is known to me. Porath has reported *Aulodesmus mossambicus* from Kamerun, but its existence there is highly improbable, the nearest relative of the Kamerun species being that from the Nile basin, collected by Schweinfurth at Seriba Ghattas, Djur, in the Bahr el Ghazal region.

#### ANALYTICAL KEY TO THE SUBFAMILIES OF GOMPHODESMIDÆ.

Sternum of sixth segment of male with two slender processes located between the bases of the anterior pair of legs and separated from each other by a considerable space; fifth segment with a pair of similar though smaller processes between the posterior legs; copulatory legs with second joint nearly straight, short, divided at apex: Subfamily MARPTODESMINÆ, p. 682.

Sternum of sixth segment of male with a single median, slender, subquadrate, or very broad and medianly excised process; fifth segment without processes; copulatory legs with second joint very long, strongly compressed antero-postically

beyond the hairy base; the compressed portion is strongly decurved and bears in the sinus a usually large and nodiform process; beyond this is a usually long and slender, flexuous flagellum: Subfamily GOMPHODESMINÆ, p. 687.

#### Subfamily MARPTODESMINÆ.

The genera of this subdivision are two in number and agree closely in habit and small size. They are most conspicuously different from the remainder of the family in having the copulatory legs short and comparatively straight, not bent in the middle and produced into the long, flexuous flagellum which distinguishes other Gomphodesmida among Merocheta.

#### ANALYTICAL KEY TO THE GENERA OF MARPTODESMINÆ.

Repugnatorial pores 11, segments 11 and 14 poreless; copulatory legs abruptly narrowed immediately above the broad base; distally with two subequal simple divisions: Genus *Marptodesmus*, p. 682.

Repugnatorial pores 13, segments 11 and 14 provided with pores; copulatory legs subconic, narrowed toward the apex and provided with a long, mesially directed, curved process and two somewhat unequal terminal divisions, the ventral (posterior) stouter and bifid at the apex; the other more slender, with several mesially directed teeth: Genus *Harmodesmus*, p. 685.

#### Genus MARPTODESMUS Cook.

*Marptodesmus* Cook, Proc. U. S. Nat. Mus., 1895, XVIII, p. 92.

*Description.*—Body of medium size, about four times as long as broad, oblong, very abruptly narrowed anteriorly, subtruncate posteriorly.

Labrum with shallow emargination and three small, rounded teeth of moderate length; supralabral bristles very numerous.

Antennæ filiform, second joint longest; joints 2, 3, 4, 5, 6 subequal; olfactory cones four, arranged in a square.

First segment three times as broad as long; anterior and posterior margins medianly straight and subparallel; lateral end rounded, the posterior corner broadly truncate, the anterior slightly so; the segment is much broader than the head, twice as long, and somewhat narrower than the exposed portion of the second segment.

Segments smooth and shining, without markings.

Lateral carinæ approximate, about one-fourth as wide as the body cavity, inserted halfway up; a fine raised margin broadest laterad, especially on poriferous and caudal segments.

Repugnatorial pores opening subdorsally in a large, deep, rounded depression of the outer slope of an intramarginal ridge of segments 5, 7, 9, 10, 12, 13, 15, 16, 17, 18, 19.

Preanal segment very short; anal segment very short, the apical portion triangular, truncate at apex, and with four punctations there; twelve other punctations, ten located as in Plate LV, fig. 2*j*, and two others lower down on the sides, below the level of the carinæ (Plate LV, fig. 2*h*).

Anal valves with strongly elevated margins; two setigerous punctations, the superior marginal, the inferior submarginal.

Preanal scale semielliptic, a broad, rounded, setigerous prominence on each side of the middle, which is not produced, but rather truncate.

Sterna broad and densely hirsute, except the first and last.

Sternum of the fifth segment of male with two large papilliform hirsute processes between the second pair of legs.

Sternum of segment 6 with two similar processes between the anterior pair of legs.

Sterna of post-genital segments of male with a stout, sharp, conical spine at the base of each leg, more pronounced on posterior segments and larger between the posterior pair of legs of each segment.

Sternum of segment 15 not different from its neighbors.

Legs of male crassate, hirsute, with long bristles, the joints in order of length 3, 2, 4, 5, 6, 1.

Second legs of male with the coxæ produced ventrad into a rounded-conic, somewhat recurved process; genital opening on the median face of the coxa, at the base of the process.

Seventh pair of legs with a broadly conic process on the apex of the inflated coxa, directed mesocephalad.

Pregenital legs of male with the distal joint supplemented at apex by a cushion-like process as long as the very slender claw.

Two distal joints of male legs roughened on the ventral face by papilliform tubercles, very large on post-genital legs.

Male genitalia with a broad basal joint; second joint incurved at base, unguinal portion subequal in length with the other, slender, straight, bifid at apex.

In this genus the first segment is much more rounded laterally than in *Astrodesmus*, being without an apparent angle; the whole segment is more convex, making the ends more decurved; it is narrower in comparison with the second segment. It is, furthermore, not submarginate toward the ends, as in *Astrodesmus*.

The greater convexity is shared by the entire body, which has the dorsum more arched and the carinæ more depressed than in *Astrodesmus*.

#### MARPTODESMUS CHANLERI Cook.

(Plate LV, figs. 2a-2j.)

*Marptodesmus chanleri* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 95, pl. IV, figs. 1-10.

\*Vertex smooth and shining, sulcus transversely rugulose, not deeply; postantennal depression subvertically rugulose near the lateral margin.

Clypeus smooth and shining; a sharp, oblique depression parallel to the lateral margin, halfway between the margin and the antennal sockets; below, a few scattering bristles, gradually longer; supralabral bristles long and very numerous, a crowded row next the margin, otherwise without apparent arrangement.

Antennae sparingly hirsute, the distal joints moderately so; basal joint bulbous, the others, except the last, obconic, with equal diameters; length, 4.5 mm.; diameter, 0.25 mm.; length of second joint, 0.8 mm.

Mentum, stipes, and lingual laminae densely hirsute with short hairs, except distally; stipes and laminae with long bristles along the margin.

First segment smooth and shining, a slight transverse depression in front of the middle; lateral ends with a fine raised margin. Medianly the segment is slightly and broadly emarginate.

Subsequent segments like the first, slightly broader and longer to the fifth; surface smooth and shining, very finely and regularly reticulate; areolate under sufficient magnifying power.

Lateral carinae irregularly rugulose inside the raised margin, more especially on posterior segments; on the first four segments the posterior margin is curved forward, while on subsequent segments it is turned more and more caudad and produced into a conical point until the projection of the eighteenth segment exceeds the nineteenth segment in length (see Plate LV, fig. 2j).

Posterior segments with scattering longitudinal wrinkles above, the submarginal wrinkles more pronounced.

Anal segment above irregularly rugulose transversely; setigerous punctations very inconspicuous. No setae were found, though their absence is probably accidental.

Anal valves not inflated, vertically rugose, the margins thick, raised, but not so strongly compressed as to be bounded by a definite furrow.

Prenal scale very thick, somewhat rugulose on the edge, mostly smooth and shining.

Sterna, especially the posterior, densely hirsute with fine, long hairs.

Processes of the sternum of the fifth segment of males straight, erect subspatulate, flattened cephalo-caudad, armed at base with a few long, divergent bristles; naked and nearly smooth distad.

Processes of the sixth segment similar in shape, armed with long bristles on their inner faces, otherwise naked; in size they are slightly larger than those of the fifth segment.

Legs of male crassate, more or less densely hirsute with very long hairs.

Coxae of first pair of male legs approximate, moderately hirsute distad. Coxae of second male legs somewhat separated, conically produced ventrad, and with irregular prominences caudad; naked except a few long bristles. Coxae of third and subsequent legs widely separated, more or less hirsute. Coxae of seventh legs of males prominent mesad, especially the anterior corner; these prominences, with the processes from the sternum, give protection to the genitalia.

Pregenital legs of male with the claw much reduced, and a white membranous or fleshy sole projecting nearly as far as the claw. This is doubtless to assist in grasping the female; the same contrivance is found among the smooth Iulidae.



Postgenital legs of males with coarse, rounded, chitinous tubercles on the inner face of the apical joint; smaller tubercles also on the sub-apical joint.

Male genitalia simple, the basal joint very small, almost hidden under the expanded reniform base of the apical, which is densely hirsute on its median face, and has some especially long bristles at the base of the unguinal portion. This last is bifid nearly half its length, the divisions subequal, one strongly falcate, the other oblique and less falcate.

Color in alcohol a faded light brown, the carinæ and ends of the anterior segments whitish. The posterior median part of each segment is lighter than the rest, except the carinæ, and the anterior part of the animal is lighter than the posterior. Legs and antennæ also light brown.

Length, 24 mm.; width, 6 mm.

*Locality*.—Tana River, East Africa.

*Type*.—One mature male in the U. S. National Museum collection.

#### Genus HARMODESMUS Cook.

*Harmodesmus* Cook, Proc. U. S. Nat. Mus., 1895, XVIII, p. 83.

Body small, about four times as long as broad, oblong; dorsum moderately convex, the carinæ somewhat horizontal.

Antennæ filiform, rather slender; joints 2 to 6 equal; olfactory cones 4.

First segment three times as broad as long, subelliptic, nearly symmetrical; the anterior and posterior margins converging laterad so that the carinæ are evenly rounded.

Segments dorsally smooth and shining, distinctly rugulose laterad.

Lateral carinæ inserted about halfway up, in width equal to about one-third the body cavity; the marginal callus distinct, moderately broad and prominent; on anterior carinæ the callus is narrowed; on the first it is short and passes very gradually into the raised margin; posterior corners of carinæ rather slightly produced, those of the posterior segments not narrowed and dentiform as in some of the larger genera.

Repugnatorial pores 13, facing dorso laterad and located in distinct excavations.

Preanal scale subsemicircular, scarcely apiculate; setiferous tubercles distinct, projecting slightly beyond the posterior margin but not exceeding the apex.

Sterna without transverse ridges.

Sternum of segment 5, with a distinct, narrowly conic process at the base of each leg of the fifth pair.

Sternum of segment 6 with larger similarly located subconic processes whose apices are turned obliquely laterad and cephalad.

Sternum of fifteenth segment unmodified.

Legs of males moderately crassate; dorsal surface of second joint scarcely inflated.

Anterior male legs to the sixth provided with a rather small fleshy sole.

Coxæ of second male legs with a slight rounded prominence in the mesial face of which is located a seminal opening.

Copulatory legs subcompressed at base, scarcely trigonal, and with a nodiform projection on the anterior side; the hairy portion is separated from the unguis by a distinct constriction or notch, as viewed from the side; the unguis portion is very short, less than half the other and bears three spiniform processes; the proximal is slender and turns mesad and distad, crossing its fellow; the other two are subequal in size and length; the posterior (ventral) turns mesad and then ventrad (cephalad); the other is directed cephalad and bears several slender spiniform teeth, which are directed mesad from its mesial margin.

#### HARMODESMUS NITENS Cook.

(Plate LV, figs. 1a, 1b.)

*Harmodesmus nitens* Cook, Proc. U. S. Nat. Mus., 1895, XVIII, p. 83.

Vertex smooth and shining, evenly convex, without hairs; the sulcus slight, the suture distinct.

Clypeus without hairs; a pair of minute setiferous punctations between the antennal sockets and about as far from each other as from the sockets; somewhat below these is another pair of punctations wider apart; lateral edges of clypeus straight, the inferior corners rather square; labral emargination slight.

Antennæ rather sparsely hirsute with short hairs.

First segment with the carinæ tilted somewhat horizontally, the anterior side somewhat downward; the raised anterior margin extends to the height of the antennæ; the posterior is somewhat shorter; the lateral part thus margined is distinctly rugulose.

Segments dorsally smooth and shining, the carinæ distinctly rugulose; the posterior subsegments are somewhat more convex than is usual, so that, viewed from the side, the body appears slightly moniliform.

Lateral carinæ with distinct raised margins in front and behind, the calli with their mesial edge distinct and longitudinal; lateral margins rounded, the corners obsolete on anterior segments, the posterior corner gradually more prominent, produced only on posterior segments.

Repugnatorial pores facing dorsolaterad, located in distinct excavations of the marginal callus, which is much broader on poriferous segments.

Anterior subsegments smooth on their anterior part, longitudinally rugulose on the posterior half; transverse sulcus very narrow and distinct, scarcely crenulate; supplementary margin very short.

Penultimate segment short, exposed portion equal to about one-third

of the preceding; the carinae broad and rounded, not exceeding those of segment 18.

Last segment rather narrowly triangular, abruptly narrowed near the small, truncate apex.

Anal valves with very thin and narrow, compressed margins, especially below; the margins are, however, not prominent and are greatly exceeded by the projection of the last segment; surface of valves and preanal scale subrugulose.

Sterna rather densely hirsute between the bases of the legs, with a naked depression in the middle, between the anterior pair.

Sternum of segment 5 with somewhat longer hairs at the base of the processes, the apices of which are naked.

Sternum of segment 6 less hirsute, the processes with long hairs near the apex.

Coxæ of second legs of male slightly prominent ventrad.

Legs of male moderately hirsute, the second joints only slightly inflated on the superior face; joints 3 and 4 distinctly more crassate than the others; joints 5 and 6 finely tuberculate on the ventral face.

Copulatory legs (Plate LV, figs. 1a, 1b).

Color of alcoholic specimens rather bright brown, the carinae yellowish.

Length, 17.5 mm.; width, 4.5 mm.; without carinae, 2.5 mm.; length of antennæ, 4 mm.; leg from tenth segment, 4 mm.

*Locality*.—Ravirondo, German East Africa.

Three mature male specimens collected by Neumann in April, 1894, are in the Berlin Museum.

#### Subfamily GOMPHODESMINÆ.

The members of this group vary as much in size as any of the diploped families, and include the most conspicuous of East African Merocheta. The peculiar copulatory legs distinguish them not alone among African forms, but separate them at once from all others.

#### ANALYTICAL KEY TO THE GENERA OF GOMPHODESMINÆ.

##### *Series I. GOMPHODESMI. Olfactory Cones 4.*

Process of sternum of sixth segment of male very broad, divided nearly to the base into two broadly rounded, thin, and lamellar lobes; copulatory legs with basal part of second joint long and slender, narrower than the unusually broad flagellum; the conspicuous nodiform process of the sinus of the copulatory legs of other genera appears here as a rather slender, flattened lateral tooth: Genus *Uloidesmus*, p. 689.

Process of sternum of sixth segment subquadrate or narrower, not extending to the bases of the legs between which it is located; copulatory legs with flagellum decidedly narrower than the basal portion, and with the process of the sinus conspicuous.....

Process of sternum of sixth segment distinctly broader than long, medianly with a broad, subrectangular excision; flagellum of copulatory legs short, very broad at base, the slender portion very short, ending in two subequal, strongly divaricate prongs: Genus *Mychodesmus*, p. 692.

Process of sternum of sixth segment semicircular, triangular, subquadrate, and medianly distinctly apiculate, or slender; flagellum slender from the base or at least with a long, slender, strongly curved or flexuous distal prolongation.....

Copulatory legs enormously elongate, much larger than the unmodified legs; the flagella strongly deurved, then turned laterad and expanded, slender and attenuate distad, the apex lying under the carina of segment 6: Genus *Neodesmus*, p. 694.

Copulatory legs mostly shorter than the others, turned mesad so that the flagella cross each other, or at least are not projected laterad; not expanded in the middle, the apices of the flagella lying near the median line.....

Sternum of segment 16 of male with a small, distinct, subconic process located at the middle of the anterior edge of the posterior subsegment; process of segment 6 twice as long as broad, somewhat narrowed in the middle, the distal corners prominent, the apical edge distinctly bidentate: Genus *Tycodesmus*, p. 697.

Sternum of segment 16 unmodified; process of segment 6 as broad as long, distally simply apiculate.....

Lateral carinae, especially the anterior, not sloping in the direction of the dorsal arch, but nearly horizontal; anterior segments with their posterior corners thickened, the very broad marginal calli there not clearly defined mesad: Genus *Omodesmus*, p. 700.

Lateral carinae sloping nearly in the direction of the dorsal arch; anterior carinae not thickened; their marginal calli not broader, clearly defined.....

Preanal scale with setiferous tubercles greatly enlarged, papilliform, much exceeding the apex; first segment with anterior and posterior margins converging to a somewhat symmetrical and produced, rounded lateral corner, the apex of which is occupied by the widened marginal callus; sterna of males without transverse ridges; sternum of segment 15 without a process: Genus *Gomphodesmus*, p. 704.

Preanal scale with setiferous tubercles scarcely exceeding the apex; first segment with lateral corner not produced, the callus not widened; segment 15 with a subtriangular process from the anterior edge of the sternum; sterna of other large forms with a distinct, transverse, medianly interrupted ridge between the bases of each pair of legs.....

Flagella of copulatory legs extended cephalad and downward in a simple and regular curve, so that their apices lie near their bases and are directed downward and backward; nodus with a large and broadly mammillate lateral prominence; first segment much narrowed laterad: Genus *Tymbodesmus*, p. 707.

Flagella with nearly two turns in a diffuse spiral, their apices lying between the bases of the copulatory legs, directed dorsad and cephalad; lateral prominence of nodus small and spiniform; first segment with a longer lateral side: Genus *Aulodesmus*, p. 713.

Series II. ASTRODESMI. Olfactory Cones 10.

Female with the coxæ of the second pair of legs produced ventrad into cylindrical processes which exceed in length the second joints of the legs and are densely hirsute with very long hairs: Genus *Merodesmus*, p. 717.

Females of *Astrodesmus*, the only genus comparable in size and habit, with coxæ not produced.....

Sternum of segment 15 of male without a process; sternum of segment 6 with a semicircular, minutely apiculate process; flagella of copulatory legs accommodated by a depression in the anterior part of the ventral surface of the seventh segment; first segment with lateral side evenly rounded, its raised margin scarcely thickened: Genus *Sphenodesmus*, p. 719.

Sternum of segment 15 of male with a subtriangular process; sternum of segment 6 with process triangular or subquadrate and apiculate; flagella of copulatory legs

not accommodated by an excavation; first segment with distinct, though rounded, lateral sides and posterior corner, the marginal callus thickened as in other segments

Copulatory legs with two large, slender spines rising from the median face of the nodus; one of these is bent laterad around the base of the flagellum; first segment proportionately long and narrow, its carinae not equaling those of the second segment: Genus *Sigodesmus*, p. 722.

Copulatory legs without conspicuous spines from the mesial side of the nodus at the base of the flagellum; first segment with carinae produced to equal or exceed those of the second segment: Genus *Astrodesmus*, p. 726.

The genus *Merodesmus*, being known only from the female, could not be satisfactorily treated in a synopsis in which the secondary sexual characters of the male play such an important part. Whether the females will also offer characters throughout the family can hardly be inferred as yet, for out of the fourteen genera thus far established females of only four are known, over three-quarters of the mature specimens extant in collections being males. As far as *Merodesmus* is concerned, however, it can not well be the female of any of the genera to which it might be supposed to be related, the long cylindrical hirsute processes of the coxæ of the second pair of legs separating it from *Astrodesmus*, the only other large genus with 10 olfactory cones.

#### ULODESMUS, new genus.

Body rather small, over five times as long as broad, oblong, tapering broadly at the ends; dorsum strongly convex, the narrow carinae de-curved nearly in the direction of the dorsal arch.

Antennæ (?).

First segment nearly half as long as broad, subreniform; margins converging laterad; lateral edge short and broadly rounded.

Segments distinctly rugulose.

Lateral carinae with lateral margins strongly developed, thick and prominent; margins of anterior segments distinct but much less developed, those of the first segment scarcely thickened laterad; posterior corners of carinae scarcely produced on posterior segments.

Repugnatorial pores 13, located in large and deep depressions facing nearly laterad; the marginal callus is strongly thickened to accommodate the poriferous depression, that of the poreless segments being scarcely more than half as thick.

Preanal scale rounded triangular, bluntly apiculate, the setiferous tubercles small, not projecting beyond the anterior margin.

Sterna without transverse ridges.

Sternum of sixth segment of male with two broadly rounded laminate processes between the bases of the anterior pair of legs.

Sternum of fifteenth segment of male unmodified.

Legs of males moderately crassate, the anterior with a small fleshy sole and claws not much reduced, the second joint prominent dorsad, but not so prominent as in the larger forms.

Copulatory legs very slender above the short and bulbous base of the second joint; broader at the first flexure, beyond which they are turned slightly laterad and describe a curve of more than a circle; not attenuate distad, divided near the apex into two stout prongs, the slender apex of the larger being recurved to point toward the apex of the shorter; nodus rudimentary.

The form of the first segment, as well as that of the whole body, and the character of the dorsal sculpture, suggest an affinity of this genus with *Sphenodesmus*, but the armature of the sixth segment and the shape of the copulatory legs render diagnosis easy.

The lateral turn and spiral curve of the copulatory legs are somewhat as in *Neodesmus*, but the large nodus there present, as well as the attenuate and elongate flagellum, render the form in reality very dissimilar.

The form of the process of segment 6 will readily distinguish this genus from all others yet known. The next genus is the only one bearing even a remote similarity in this respect, and it is very distinct in the form of the copulatory legs. The form of the first segment, the rugulose dorsal surface, and the dark-brown color suggest *Sphenodesmus*, which is distinct in the undivided process of segment 6, the form of the copulatory legs, and in the 10 olfactory cones of the antennæ.

The long, spiral, copulatory legs indicate possible affinity with Porat's *Eurydesmus cafferarius* here placed provisionally in the genus *Neodesmus*, but as the process of segment 6 is described as simply triangular and the size is considerably greater than that of *U. micramma*, it seemed better not to refer it to *Uloidesmus*.

#### ULODESMUS MICRAMMA, new species.

(Plate LVI, figs. 1a-1c.)

Vertex without hairs, convex and prominent, the surface coriaceous or subrugulose; sulcus and suture distinct, meeting the suboblique interocular sulci at the lower end; the lower end of the vertical sulcus and the oblique sulci are more distinctly rugulose.

Clypeus with two pairs of setiferous punctations and a few others somewhat irregularly placed above the supra-labral groove, which is densely hirsute and punctate; lateral edges of clypeus slightly emarginate, the corners rounded.

Labrum with margin nearly transverse, the emargination narrow and shallow.

First segment subreniform, the anterior margin convex, carried around at the sides to an evenly rounded lateral carina about equal in lateral and ventral projection to that of the second segment; raised margin of anterior and posterior edges distinct, carried around the lateral corner without being widened into a distinct callus; surface coriaceous, especially on the carinæ; posterior margin slightly emarginate medianly.

Segments dorsally distinctly rugulose coriaceous, evenly convex and strongly arched.

Lateral carinæ narrow, less than one-fifth the body cavity, inserted about the middle line of side; dorsal surface decurved nearly in the direction of the dorsal arch, only the very large marginal calli projecting laterad; the calli about twice as thick on poriferous segments; anterior edge distinctly margined, the posterior very indistinctly; posterior corners scarcely produced except upon posterior segments; dorsal surface very distinctly rugulose.

Repugnatorial pores facing nearly laterad, surrounded by a fine raised rim and located in a large depression near the middle of the callus, which is distinctly widened opposite the pore.

Below the carinæ the segments are distinctly and finely rugulose; above the base of the leg a small carina.

Anterior subsegments distinctly, though finely, granular rugulose, the transverse constriction distinct and rather long, distinctly and irregularly crenulate; supplementary margin rather short.

Penultimate segment short, its carinæ short, broadly conic, included between the carinæ of segment 18, which are also unusually short and broad.

Last segment short, broadly triangular, narrowly and distinctly truncate.

Anal valves slightly rugulose vertically, the margins distinct, distinctly compressed and moderately prominent.

Preanal scale faintly rugulose, broadly triangular, slightly apiculate, the setiferous tubercles small, distinct, slightly projecting, not equaling the apex.

Sterna sparsely hirsute, the middle and anterior more densely so, and with longer hairs; no transverse ridges; the sterna are flat and plane in the middle and slightly raised at the bases of the legs; on middle and posterior segments the posterior edge of the sterna is broadly produced and rounded caudad, and the posterior part turned slightly ventrad, apparently so as not to interfere with coiling in a spiral.

Coxæ of second pair of legs of male prominent ventrad, the projection thick and rounded.

Process of segment 6 with a few very long hairs on the posterior face and ventral margin; the broad and rounded lobes are not entirely symmetrical, being a little more prominent laterad than in the middle of the distal margin.

Seventh segment with rim of copulatory aperture projecting on the sides, deeply cut away behind.

Legs of male moderately robust and hirsute, scarcely tuberculate; fleshy sole of anterior pairs moderately developed.

Copulatory legs (Plate LVI, figs. 1a-1c).

Color of alcoholic specimens uniform dark brown, possibly stained from large *Spirostrepti* in the same bottle.

Length, about 20 mm.; width, 3.7 mm.; without carinae, 2.8 mm.; length of leg from tenth segment, about 3 mm.

*Locality.*—Natal, Durban and Maritzburg; two male specimens collected by Schenck are in the Berlin Museum.

MYCHODESMUS, new genus.

Body small, less than five times as long as broad; dorsum moderately convex, the proportionally rather broad carinae tilted somewhat horizontally.

Antennae filiform, rather robust; second joint slightly longer than the four following, which are subequal; olfactory cones four.

First segment subreniform, less than three times as broad as long, the posterior margin much more nearly transverse than the anterior, which is laterally carried backward in a nearly even curve to the rounded posterior corner.

Segment dorsally evenly convex, smooth in the middle, rugulose in the margins.

Lateral carinae with marginal callus of moderate width and prominence, continuous with finely raised margin in front and behind; poreless carinae with callus much narrowed, those of the first segment very narrow and passing insensibly into the raised margins; posterior corners of carinae slightly produced, projecting only on a few posterior segments, where they are broad and not dentiform.

Repugnatorial pores 13, located in very distinct excavations and facing nearly laterad.

Preanal scale distinctly triangular and apiculate, the setiferous tubercles small, much exceeded by the apex.

Legs of male slightly crassate, the first six with fleshy sole of last joint very small, the claw scarcely reduced.

Coxae of second male legs with a suboblique, broadly rounded prominence.

Sternum of segment 6 with a broad, subquadrate process which has a deep, subrectangular notch in the middle.

Sternum of segment 7 with rim of copulatory aperture not produced.

Sternum of segment 15 without a process.

Copulatory legs subtrigonal at the somewhat bulbous base of the second joint, then strongly compressed and recurved in the usual manner; the nodus is very large and irregular; the flagellum is very thick and bulbous at base and is rapidly narrowed into a short, slender process which ends in two short, subequal, divergent prongs; thus the whole apical part of the structure from the top of the curve at the base of the nodus to the end of the flagellum is shorter than the remaining proximal portion. The swollen nodus and base of the flagellum are hollow, suggesting the possibility that the seminal fluid is stored there. The usual spine on the mesial side of the base of the flagellum is present, but very small.



Viewed from the mesial face, the broad base of the flagellum is seen to be merely a concave expansion, suggesting that of *Neodesmus*, notwithstanding the great difference in the form of the copulatory legs and the process of the sixth segment. The only other genus with which *Mychodesmus* will bear comparison is *Sphenodesmus*.

MYCHODESMUS MACRAMMA, new species.

(Plate LVI, figs. 2a, 2b.)

Vertex smooth and even, without hairs; suture and sulcus distinct.

Clypeus without hairs, rather flat; three pairs of setiferous punctations, the upper pair farther apart than in *Neodesmus*.

Antennæ rather robust, with the sixth joint slightly thicker than the others; moderately hirsute, with short hairs.

First segment subreniform, not symmetrical, the anterior margin being carried around to meet the posterior, which is nearly transverse, but has the usual broad emargination in the middle.

Segments dorsally smooth or faintly coriaceous in the middle, becoming rugulose laterad, distinctly so upon the carinæ.

Lateral carinæ with distinct raised margins in front and behind; marginal calli moderately distinct and prominent, distinctly broader on poriferous segment, the carinæ of which are also more distinctly rounded; posterior corners squared on anterior and middle segments, produced only on the posterior, and there only broadly.

Repugnatorial pores located in rather small but distinct cavities, those of the anterior and middle segments facing more nearly laterad than those of the posterior, but the cavities are not placed so far laterad as to cause the edges to appear emarginate, as in some species.

Penultimate segment of moderate length, the carinæ broader than long, rounded, not exceeding those of the eighteenth segment.

Last segment of moderate width, triangular, abruptly narrowed below the narrow, distinctly truncate apex.

Anal valves with margins rather distinct and narrow, though not strongly compressed nor prominent; surface of valves and preanal scale faintly rugulose.

Sterna nearly naked, a few long hairs near the posterior margin.

Sternum of segment 6 with lateral edges somewhat sloping; the two lobes are broadly rounded and more prominent laterad, sloping gradually mesad into the broad and shallow notch, the corner of which is greater than a right angle; the process is moderately hirsute, with long hairs, as are the prominent coxæ of the sixth pair of legs.

Legs moderately hirsute, with rather short hairs, a few long hairs on the basal joints more numerous cephalad; the second joint is only slightly inflated on the dorsal face.

Copulatory legs (Plate LVI, figs. 2a, 2b).

Color of alcoholic specimen distinctly brown, darkest on the dorsal

parts of the posterior subsegments; the head, legs, and antennae lighter; the carinae pale, perhaps white or yellow in life.

Length, 15 mm.; width, 3.4 mm.; without carinae, 2.3 mm.; length of antennae, 3.3 mm.; of leg, 3.8 mm.

*Locality.*—A single male specimen, collected by Neumann at Ravi-rondo, German East Africa, April, 1894, is in the Berlin Museum. It was taken from the same bottle with the types of *Harmodesmus niteus* and *Sphenodesmus rugulosus*, which indicates that a large Gomphodesmid fauna may be expected from that region.

#### NEODESMUS, new genus.

Body rather small, about five times as long as broad; dorsum rather strongly convex, the rather narrow carinae sloping nearly in the direction of the dorsal arch.

Antennae filiform, rather robust, second joint slightly longer than the four following, which are subequal with the sixth, scarcely exceeding the others; closely similar to those of *Sphenodesmus*, but the olfactory cones four.

First segment subreniform, somewhat more than twice as long as broad, not strongly narrowed (shortened) laterad, but evenly rounded; posteriorly broadly emarginate.

Segments dorsally evenly convex, distinctly rugulose.

Lateral carinae with marginal callus prominent, continuous in front, scarcely so behind; calli of anterior segments narrow, distinct; that of first segment passes gradually into the raised margins; posterior carinae rather slightly and broadly produced, as in *Sphenodesmus* and *Uloidesmus*.

Repugnatorial pores 13 (or 12?), located in distinct excavations somewhat behind the middle of posterior subsegments.

Preanal scale broadly triangular, the apex distinct and sharp; setiferous tubercles distinct, prominent ventrad, but not projecting caudad as far as the apex.

Sterna of male without transverse ridges.

Sternum of segment 6 of male, with a stout, subtriangular process.

Sternum of segment 16 without a process.

Legs of male slightly crassate; dorsal face of second joint moderately inflated.

Anterior male legs with the fleshy sole well developed; claw distinctly reduced.

Coxae of second male legs with a broad, subconic ventral prominence, a seminal opening in its flattened ventral posterior face.

Copulatory legs with second joint subbulbous and trigonal at base, then moderately compressed and flexed, as usual in this subfamily; the nodus is narrowed at base, and, viewed from the side, is deeply notched, the sinus rounded and the lobes connivent; in addition there is a strong spine directed mesad; a single large spine rises from the base

of the flagellum, as in many of the other genera; the base of the flagellum beyond the nodus is rather stout, and is then widened, flattened, and excavate, the flattened portion extending laterad; beyond this the leg terminates in an evenly curved and gradually narrowed spine, directed in general upward, with its apex lying under the carina of the sixth segment.

The copulatory legs of the type of this genus are very remarkable and readily distinguish it from all others; instead of being turned mesad beyond the nodus, the flagella nearly touch the bulbous base of the second joint and are then bent abruptly laterad, expanded and hollowed out into a somewhat spoon-shaped structure, which seems to be continuous with the seminal duct of the spiniform terminal portion. No such expansion or cavity occurs in the other genera. Its existence is probably indicative of some biologic peculiarity in the present genus. Perhaps the cavity in the expanded portion of the copulatory leg accommodates the seminal fluid, which it would not in that case be necessary to carry down to the reservoir of the basal joint.

The specimen which has served mainly for the above description presents a hitherto unknown abnormality in that the eleventh segment has a pore on one side and none on the other. The distribution of the pores in the present order is, as far as any recorded observations are concerned, absolutely constant in the same species, but the present instance shows that such variation is not impossible, and should accordingly be sought for the more carefully as furnishing evidence on the systematic value of the pore formula.

NEODESMUS JUVENIS, new species.

(Plate LVI, figs. 3a-3c.)

*Eurydesmus mossambicus* PETERS, Reise Nach Mossambique, Zoologie, 1862, V, p. 533, *pro parte, i. e.*, the animals supposed by Peters to be young.

Vertex without hairs, not strongly convex, distinctly rugulose; sulcus distinct below, obsolete above; suture distinct.

Olypeus not hirsute, rather flat; a pair of setiferous (?) punctations near together near the lower end of the sulcus of the vertex; two pairs of similar punctations much wider apart between these and the labral edge; lateral edges of labrum slightly emarginate, the lower corners rather square.

First segment subreniform by reason of the broad posterior emargination; the lateral carinæ are somewhat evenly rounded, the posterior corner being nearly obsolete; submarginal ridge somewhat more pronounced than in *Sphenodesmus rugulosus*, broadest at the posterior corner and gradually narrowed into the anterior raised margin; posterior raised margin very short.

Segments densely and finely rugulose over their entire surface.

Lateral carinæ rather narrow, inserted about halfway up; marginal callus distinct and moderately prominent, not greatly broadened on

poriferous segments; the surface of the marginal callus is also somewhat rugulose.

Repugnatorial pores facing laterodorsad; on the specimen studied there is a pore on one side of the eleventh segment and none on the other, so that the normal number of pores is in doubt.

Penultimate segment moderately exposed, its carinæ broadly rounded, not dentiform, not exceeding those of the eighteenth segment.

Last segment broadly triangular, the apex rather broadly truncate and abruptly contracted, so that the sides appear somewhat notched.

Anal valves with distinct, though not very prominent, margins, the setiferous tubercles small, and the surface faintly rugulose.

Sterna rather densely hirsute with long hairs.

Process of segment 6 also hirsute with long hairs; as in some of the other genera, the coxæ of the sixth pair of legs are prominent toward the process, and hirsute with long hairs.

Seventh segment with the rim of the copulatory aperture not produced, even at the sides.

Legs of male moderately hirsute with rather long hairs, finely tuberculate on the ventral face of the distal joints.

Copulatory legs. (Plate LVI, figs. 3a-3c.)

Color of previously dried alcoholic specimen, bone yellow.

Length, about 22 mm.; width, 4 mm.; without carinæ, 2.9 mm.

*Locality*.—Dr. Peters reported his species from various places in the vicinity of Mozambique, island of Mossambique, Cabaceria, Rios de Sena, Querimba, and Tette. At which place these supposed young specimens were taken does not appear.

It may be well to note a suspicion that the rugulose surface described for this species is due to some accident in the history of the specimen. At the same time, the character appears with such regularity as to seem quite normal.

#### NEODESMUS CAFFRARIUS (Porat).

*Eurydesmus caffrarius* PORAT, Oefersigt f. K. Sv. Vet. Akad. Foerh., 1872, No. 5, p. 13.

*Sphenodesmus caffrarius* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 93.

Body strongly convex, glabrous above, setose below between the coxæ, scarcely attenuate posteriorly.

Head with very few setigerous foveæ. Vertex medianly longitudinally sulcate, subglabrous. Clypeus subglabrous, margin setose.

Antennæ shorter than the breadth of the body, 6 mm. long.

First segment with anterior margin laterally thickened, oblique, nearly straight or very slightly sinuate; posterior straight, sides curved forward, processes rounded.

Segments glabrous, nearly smooth, or irregularly coriaceous under a lens; lateral carinæ thickened, somewhat ascending posteriorly, anterior angle rounded, posterior slightly acute, slightly prominent, more

acute on segments 16 to 19; ventral surface between segments 6 and 7 with a prominent triangular lamina.

Repugnatorial pores rather dorsal than lateral, placed a little behind the middle of the carina.

Last segment prolonged, apex truncate, transversely impressed near the apex; setæ few.

Anal valves margined, with two pairs of setæ. Preanal scale large, simple, or indistinctly trifid, the median lacinia far the longest; setigerous tubercles 2.

Legs of pairs 1 to 6 with a pulvillus on the last joint; a triangular prominent lamina between segments 6 and 7.

Legs shorter than the breadth of the body, 5 mm.

Copulatory legs much protruding, spiral, setose, the external margin bidentate, with a lacinia near the inflexed apex.

Color of alcoholic specimens testaceous.

Length, 34 mm.; breadth, 6.5 mm.

*Locality*.—Caffraria. Known only from Porat's description.

The generic position of this species is still in doubt. On the discovery of *Neodesmus* it appeared that *caffrarius* might be related by reason of the spiral copulatory legs, but Porat distinctly says that the process of the sixth segment is triangular. As the copulatory legs are large and protruding, and there seems to be greater similarity in size as well as distribution, it seems best now to place this species next to *N. juvenis*, rather than leave it under *Sphenodesmus*, where it would be less likely to be sought if determination were attempted by means of the synopsis of genera.

#### Genus TYCODESMUS Cook.

*Tycodesmus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 83.

Body rather large, about five times as long as broad; dorsum moderately convex, the carinæ somewhat horizontal.

Antennæ filiform, second joint longest, four following subequal, successively slightly shorter distad; olfactory cones 4.

First segment about three times as broad as long; anterior margin subtransverse; the posterior turned forward laterally so that the carinæ are narrower than the median portion.

Segments dorsally smooth and shining, somewhat uneven laterad and with traces of transverse rows of granules on the posterior segments.

Lateral carinæ with thickened margins well developed and continued upon the anterior edge of the carinæ, scarcely upon the posterior, those of the anterior as broad as the others; posterior corners moderately produced.

Repugnatorial pores 13, located in distinct depressions.

Preanal scale triangular, pointed, setiferous tubercles distinct, small, close to the apex and not exceeding it.

Sterna without transverse ridges, somewhat excavate medianly as in *Gomphodesmus*.

Sternum of sixth segment of male with a process over twice as long as broad, slightly narrower in the middle and expanded distad where it bears two conical teeth; the distal corners are also somewhat produced into short, rounded processes.

Sternum of seventh segment medianly deeply and broadly emarginate behind the insertion of the copulatory legs, leaving a sharp laminate process at the base of each of the normal legs.

Sternum of the eighth segment with a distinct conic process at the base of each leg of the posterior pair.

Sternum of fifteenth segment unmodified.

Sternum of the sixteenth segment with an abrupt median subconic process immediately behind the transverse constriction; this process is directed ventrad.

Legs of males slender, the anterior scarcely more robust; dorsal surface of second joint moderately inflated; legs 1 to 6 with a distinct fleshy sole, but with claws less reduced than in the larger genera.

Coxæ of second male legs produced into a short oblique cone.

The copulatory legs of this genus are so constructed as to suggest rather strongly those of *Gomphodesmus*, the more striking differences being that the node is much more strongly constricted at base, the lateral spine at the base of the flagellum is entirely wanting, and the flagella are not recurved or coiled, but merely flexuous; their apices lie between the bases of the copulatory legs.

The first segment is proportionally somewhat longer medianly, shorter laterally, and with the marginal callus much more strongly developed, than in *Astrodesmus*; the posterior corner is, however, less strongly developed and the marginal callus not so broad as in *Gomphodesmus*.

In general form and habit the type of this genus resembles most nearly *Astrodesmus*, the dorsal convexity being only slightly greater and the carinæ only slightly more horizontal. Outside of the secondary sexual characters the generic differences are mostly quantitative. The interantennal suture is more distinct, the antennæ are more slender, the marginal calli somewhat broader, the penultimate segment shorter, and the projecting portion of the last segment narrower at base. The secondary sexual differences are numerous and important, the sternal ridges and the process of the fifteenth segment are absent, the process of the sixth segment is slender, broader at apex, and bidentate or apparently quadridentate, on account of the sharp lateral shoulders; the seventh segment is deeply emarginate medianly behind the copulatory legs, and with a sharp, flattened tooth on each side at the base of the normal legs; there is a distinct subconical process at the base of each leg of the eleventh pair, the posterior pair of the eighth segment; the sternum of the sixteenth segment has an abrupt process in front.

In *Astrodesmus* the seventh segment has a median, rounded, flattened expansion behind the copulatory legs, between the normal pair; there are no conic processes on the eighth segment nor on the sixteenth segment.

The processes located at the bases of the posterior pair of legs of the eighth segment are narrower and longer than those of *Tymbodesmus*, the other genus to which the present might be most properly compared, and which has these processes much more developed than in any of the remaining genera.

#### TYCODESMUS MEDIUS Cook.

(Plate LVII, figs. 1a-1c.)

*Tycodesmus medius* Cook, Proc. U. S. Nat. Mus., 1895, XVIII, p. 83.

Vertex without hairs, polished and shining; the sulcus distinct, as well as the transverse sulcus connecting the antennal sockets.

Clypeus with lateral depressions moderate; a transverse row of minute punctations above the labrum.

Guathochilarium densely pilose.

First segment with posterior margins broadly emarginate in the middle and turned ahead laterad; marginal callus distinct, the anterior and posterior margins distinct on the carinæ.

Segments dorsally smooth and shining, uneven under a lens, rugulose on the carinæ and distinctly inflated at the base of the carinæ, as in *Aulodesmus*; on posterior segments there are faint traces of granules in transverse rows, and the surface of these segments is also more distinctly rugulose.

Lateral carinæ more than one-fourth as wide as the body cavity; marginal callus tapering gradually to the distinct anterior margin; posterior margin very fine or indistinct; posterior corners moderately produced, about as in *Astrodesmus stellifer*, slightly more on posterior segments; below the carinæ the segments are nearly smooth, the secondary carina very small, but distinct.

Anterior subsegments smooth and shining, very minutely striolate-rugulose under a high power; transverse constriction distinct, not crenulate.

Penultimate segment very short, the small dentiform carinæ exceeded by those of the eighteenth.

Last segment also very short, concealed from above by the preceding two; apical projecting portion long, narrow, the apex itself rounded.

Anal valves striolate-rugulose, the margin weak.

Preanal scale broadly triangular, apiculate, the setiferous tubercles small, projecting somewhat ventrad, not exceeding the apex; surface nearly smooth.

Sterna naked except a few hairs along the posterior edge.

Process of sixth segment hirsute laterad and distad.

Legs of male sparsely hirsute, except the anterior, of which the ventral faces of the basal joints are clothed with long hairs.

Male genitalia, see Plate LVII, figs. 1a-1c.

Color of alcoholic specimen grayish brown, the posterior margin of each segment, the carinae, antennae, and legs, yellowish brown.

Length, 50 mm.; width, 10.5 mm.; without the carinae, 6.5 mm.; length of antenna, 8.5 mm.; length of leg from tenth segment, 9.5 mm.

*Locality.*—A single male specimen collected by Röhmer at Mpapua, German East Africa, is in the Berlin Museum.

#### OMODESMUS, new genus.

Body rather large, about five times as long as broad, oblong, tapering slightly at both ends; dorsum slightly convex and the carinae more nearly horizontal than elsewhere in the present family.

Antennae (?).

First segment slightly less than three times as broad as long; posterior margin nearly straight, the lateral parts only slightly curved forward.

Segments show faint traces of three transverse rows of small granules.

Lateral carinae with lateral thickened margins well developed and distinctly continued upon the anterior and posterior edges of the carinae; on anterior segments the lateral margins are strongly thickened and very broad; the posterior corner of these segments is also strongly thickened, so that the broad margins are not distinct mesad. Corners of all carinae more prominent and produced caudad than in other known genera of the family.

Repugnatorial pores 13.

Preanal scale minutely apiculate; setiferous tubercles distinct, close together.

Sterna with a distinct, transverse, medianly interrupted ridge between the bases of each pair of legs.

Sternum of sixth segment of male with an oblong, strongly apiculate process between the bases of the anterior pair of legs.

Sternum of fifteenth segment of males with a broadly ensiform process projecting cephalad from between the anterior pair of legs into a socket in the posterior part of the fourteenth.

Legs of males rather slender, scarcely crassate; dorsal face of second joint inflated into a large, rounded prominence; anterior six male legs with a small fleshy sole at the apex of the last joint below.

Coxae of second male legs produced ventrad into an obliquely conic process with the seminal opening located in a slight depression of its ventroposterior face.

Male genitalia with second joint proximally hirsute and trigonal, the unguis proximally strongly compressed and strongly curved cephalad upon itself; it is then expanded into a large, irregu-



larly shaped node, which bears a long spine on its median face and a shorter one on its lateral, both directed distad; from the anterior (by flexure posterior) face of the node rises a simple flagellum, which describes a subelliptic curve and has its base and apex protected by the smaller and larger spine, respectively.

### OMODESMUS OXYGONUS (Peters).

(Plate LVII, figs. 2a, 2e.)

*Eurydesmus oxygonus* PETERS, Reise nach Mossambique, Zoologie, 1862, V, p. 535.

*Autodesmus oxygonus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 89, pl. III, figs. 10-14; pl. VI, figs. 4-7.

Vertex without hairs, smooth and even; sulcus distinct, not connected below with the antennal sulcus; about midway between the lower end of the sulcus and the antennal sockets is a distinct setiferous (?) punctation.

Clypeus not hirsute, even; lateral excavations shallow; punctations of the lower part obscure; above with a pair of small, distinct punctations somewhat wider apart than those mentioned in the preceding paragraph and half as far from them as from each other.

Antennæ lost.

Gnathochilarium densely hirsute, shaped, as far as can be seen, as in *Astrodesmus stellifer*.

First segment convex in front and behind, distinctly margined on the anterior corners and thickened on the posterior.

Segments dorsally finely coriaceous and somewhat rugulose, the wrinkles being most pronounced at the anterior shoulder of the carinæ, from which they extend obliquely caudad and mesad; three rows of very indistinct and small tubercles; these are scarcely prominent and are indicated mostly by small spots of darker color, finer and closer together on the posterior segments.

Lateral carinæ margined in front and behind, the lateral margin strongly thickened and convex; all the margins smooth and shining; on the second segment the posterior corner is nearly a right angle, while on all others it is produced caudad, increasingly so on the middle and posterior segments.

Repugnatorial pores facing dorsad and laterad, located slightly in front of the middle of the thickened margin, though on posterior segment, by reason of the posterior production of the carinæ, they are nearly on a line with the posterior margin of the segments.

Below the carinæ the segments are densely rugulose longitudinally, with occasional scattering prominences.

Anterior subsegments even and shining, marked with very short and fine impressed lines or striations; transverse constriction distinct though not deep, polished, faintly crenulate.

Penultimate segment very short, the exposed part equal to less than

half the preceding; the carinae small and dentiform, not projecting as far as those of segment 18.

Last segment short, broadly triangular, rounded and subtruncate at apex, dorsally with several transverse furrows, the deepest of which separates the apically thickened and somewhat upturned part of the segment from the basal.

Anal valves scarcely convex, rugulose; margins distinct, prominent, shining, subcompressed.

Preanal scale rugulose, triangular; the apex pointed; setiferous tubercles located close to the apex, large and prominent ventrad, not projecting caudad beyond the apex.

Sterna sparsely hirsute with long hairs; the bases of the legs connected, except at the middle line, by distinct, sharp, transverse ridges.

Process of the sternum of the sixth segment hirsute distad with very long hairs; apically thickened and pointed; broader below, especially from slight shoulders about the middle.

Process of sternum of fifteenth segment, as in *Astrodesmus stellifer*, broadly subtriangular and rounded, medianly grooved below; the edges of this process continuous with the transverse ridges found on other sterna.

Legs of male hirsute with long bristles, especially on the distal joints of the anterior; tubercles wanting.

Anterior male legs with fleshy apical sole small, present on the first six pairs.

Copulatory legs with the basal part of the second joint much longer proportionally than in *Astrodesmus*; viewed from below, they show a long spine, which in *Astrodesmus* appears only as a small denticule; the slender flagella rise from the posterior side of the large knot-like thickening at the base of a posteriorly directed tubercle; the flagellum curves strongly dorsad, then cephalad, mesad, and finally again dorsad, and ends in a small mesially directed hook which lies on the base of the large spine referred to above; thus each flagellum is coiled upon its own leg and does not cross to the other side and become entangled with its fellow.

Color of dried specimen pale alutaceous, the legs showing a tinge of reddish, which, according to Peters's figure, was shared by the whole body.

Length, 55 mm.; width, 11.4 mm.

*Locality*.—Rios de Sena, near the Zambesi. Dr. Peters collected three male specimens, and at first considered them a variety of *mosambicus*. That from which the above description was drawn is No. 199 of the Berlin Museum.

This species is strikingly distinct from other Gomphodesmidæ in the more horizontally directed carinae, which cause the dorsum to appear unusually flat, and by the greater posterior production of the carinae. The form of the copulatory legs is also quite distinct from that of *mos-*

*sambicus*, the type of the genus *Aulodesmus*, to which it was previously referred, the present species being without doubt more similar to *Aulodesmus* than to *Astrodesmus* in this respect. It can hardly be said, on the other hand, that it is more similar to *Aulodesmus* than that genus is to *Astrodesmus*, and the different habit resulting from the more flattened dorsum and produced carinæ, together with the distinct and strongly elevated anterior and posterior margins of the carinæ, the very broad, thickened, and somewhat indistinctly defined lateral margins of the anterior carinæ, the much straighter posterior margin of the first segment, the more apiculate process from the sternum of the sixth segment of male, and the greater development of the curious prominence from the dorsal side of the second joint of the anterior male legs, furnish structural data leading to the inference of generic distinctness from both *Astrodesmus* and *Aulodesmus*, in both of which the anterior and posterior edges of the carinæ are narrowly and rather indistinctly margined, the lateral thickened margins of the anterior carinæ are narrow and well defined along the mesial side, and the posterior margin of the first segment is curved distinctly cephalad on each side, so that the lateral length is distinctly less than the mesial, which condition appears to a very much less degree in *orygonus*. Here the posterior part of the raised margin is, as in the other anterior segments, very broad, strongly thickened, and poorly defined mesad; the whole carina is also, as on the other anterior segments, tilted more horizontally than the general slope of the mesial arch, which in the other two genera is scarcely varied, even on the anterior segments. From *Aulodesmus* the new genus is also distinct in the greater production of the coxæ of the second legs of male, the much less hirsute sterna and legs, the more distinct and abrupt transverse constriction of the segments, and in the proportionally greater robustness of at least the second joint of the antenna, the others having been lost. The rudiments, though slight, of dorsal sculpture in the form of three transverse rows of tubercles are interesting and of some phylogenetic importance in the present family, from which similar traces have so generally disappeared.

Recently Count Attems<sup>1</sup> has reported this species from Zanzibar, but I am inclined to doubt the determination on account of the fact that the other Mozambique Diplopoda described by Peters have not been found in the Zanzibar region, and for the further reason that the identification was made without an examination of the type, while the literature employed by Count Attems appears quite insufficient as the basis of a trustworthy reference.

<sup>1</sup>Beschreibung der von Dr. Stuhlmann in Ost-Afrika gesammelten Myriopoden. Mitth. Naturh. Mus. Hamburg, 1896, XIII, p. 26.

## Genus GOMPHODESMUS Cook.

*Gomphodesmus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 83.

Body large, nearly six times as long as broad, tapering slightly cephalad, scarcely so caudad near the end; dorsum strongly convex, the carinæ decurved in the direction of the dorsal arch.

Antennæ filiform, second joint longest, four following subequal.

First segment scarcely more than twice as broad as long; anterior margin subtransverse, the posterior laterally carried around to meet it at a small angle produced below the level of the other carinæ.

Segments dorsally polished and shining.

Lateral carinæ about one-fourth as wide as the body cavity, inserted at about the middle of the sides; lateral margins with a rather broad distinct callus extending along the anterior and posterior edges of the carinæ as a narrow distinct margin; on anterior segments the marginal callus is broad but distinct; on the first segment the callus occupies the entire lateral corner; posterior corners of carinæ produced increasingly caudad from about the seventh, though only segments 15 to 18 have the corners much exceeding the posterior margin of the segment.

Repugnatorial pores 13, located in large depressions, as in *Astrodesmus*.

Preal anal scale semicircular, apiculate, the setigerous tubercles more remote than in the other large genera, very large, papilliform and greatly exceeding the apex.

Sterna without distinct transverse ridges, somewhat excavate in the middle in front and with a small subconic prominence or very short ridge at the base of each leg.

Sternum of sixth segment of male with a nearly square, strongly apiculate process between the bases of the anterior pair of legs.

Sternum of fifteenth and sixteenth segments of male unmodified.

Legs of males distinctly crassate, dorsal face of second joint inflated, especially in the anterior; legs 1 to 5 of male with a small fleshy sole at apex, the claw distinctly reduced.

Coxæ of second male legs produced ventrad into a blunt protuberance.

Male genitalia constructed as in *Astrodesmus* and *Aulodesmus*, but with the node constricted at base, the flagellum broad and compressed at base, rather robust throughout and twice bidentate distad; it makes a single subcircular curve, crossing and lying against its fellow.

Females with coxæ of second legs produced ventrad into a small conic spine similarly situated to that of the male; laterally above the insertion of the second joint the coxæ are expanded and bear two rounded flattened processes; the second legs are deeply inserted, and on each side of their bases is a large, round, deep cavity; the sternum of the third segment is strongly produced ventrad into a thin plate, broadly and deeply emarginate medianly.

In this genus the copulatory legs are again constructed on the plan followed by *Astrodesmus* and *Autodesmus*, but with some unique features. The basal part of the trigonal second joint is greatly reduced, while the node is curiously developed, being constricted at its base and borne as a projection from the anterior (by flexure posterior) face of the antico-postically compressed structure; the two spines described in *oxygonus* are still recognizable, being located at the base of the nodus and flagellum. The nodus bears in addition, however, two small conical spines on its lateral face, and two which project against and are covered by the upright part of the compressed portion at the beginning of the curve, and also another, large, strong, and curved, which is directed mesad at first, and curves around the base of the compressed portion. The flagellum is broad and compressed at the base, but is soon abruptly narrowed, although still compressed; it curves in nearly a circle, crossing its fellow, is bifid near the apex, the larger division taking a spiral turn and being again bifid. Thus, while the plan is evidently the same, the details are nearly all different.

Although the first segment is in reality proportionally longer than in the other genera, the relation between the length and breadth is somewhat affected by the fact that it is very strongly convex, so that the carinae are decurved and do not project laterad. If the segment were flattened out it would be as broad as any on account of its produced lateral corners.

The segments are more convex, and more evenly so, with the surface more highly polished, and the posterior corners of the carinae less produced than in the other large genera with which it is compared.

The marginal callus, though distinctly broad on anterior segments, does not taper abruptly cephalad as in *Omodesmus oxygonus*, the mesial edge being more nearly longitudinal.

#### GOMPHODESMUS CASTANEUS Cook.

(Plate LVIII, figs. 1a-11.)

*Gomphodesmus castaneus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 83.

The vertex is without hairs, highly polished and shining; sulcus distinct, ending below in a considerable depression which is connected with the antennal sockets by suboblique, finely rugulose, scarcely depressed lines.

Clypeus also polished and shining, evenly convex, the lateral depressions very slight, with a few oblique sulci, a pair of minute punctations somewhat below the level of the antennal sockets, and a somewhat irregular transverse row of about ten above the labrum.

Labrum inserted much below the level of the clypeus, the anterior edge transverse, the emargination very narrow and slight, the teeth very small.

Guathochilarium hirsute with fine, short hairs.

Proc. N. M., vol. xxi—45

First segment scarcely more than twice as broad as long; posterior margin distinctly and broadly emarginate in the middle, laterally directed obliquely cephalad; anterior margin transverse or very slightly emarginate medianly, more strongly so laterally opposite the antennal sockets, and converging toward the posterior margin by considerably less than a right angle; as a whole the anterior margin would be nearly transverse if the body were extended in a straight line, while the posterior curves forward to meet it at a small angle, as mentioned above. There is thus no lateral margin proper, and the lateral corner is produced ventrad considerably below the line of the other carina, a condition not observed in the other genera of the family. Lateral callus not strongly thickened, but well defined, subtriangular in shape, occupying the extreme corner of the carina and continued along the anterior and posterior edges as a fine raised margin, more distinct on the anterior edge, but not reaching the middle.

Second segment with the carinae laterally produced beyond the level of the third; anterior edge distinctly margined; posterior less so; the marginal callus on this segment and the two following is as broad as that of the fifth segment.

Segments dorsally strongly polished and shining, minutely punctulate under a lens; posterior segments rugulose laterad inside the marginal callus.

Lateral carinae strongly margined in front, distinctly, though less strongly, behind; the marginal callus is not abruptly narrowed in front of the pore as on the anterior segments of *Aulodesmus*, but tapers gradually into the narrow margin.

Repugnatorial pores located in deep, circular excavations half as wide as the marginal callus.

Below the carinae the segments are finely rugulose; the secondary carinae slight, finely granulated.

Anterior subsegments minutely striolate and rugulose longitudinally, distinctly rougher under a lens than the posterior subsegments; transverse constriction distinct, polished, finely crenulate.

Penultimate segment not greatly shortened, the apices of its carinae slightly exceeding those of segment 18.

Last segment with triangular apical portion truncate, slightly tilted up; the setiferous punctations located in slightly prominent rings.

Anal valves rather strongly rugulose-striate below; setiferous tubercles small, distinct, the lower pair separated from the margin.

Preanal scale nearly smooth, nearly semicircular, minutely apiculate, the setiferous tubercles enormously enlarged, suggesting those of *Lacnodesmus flabellatus* of the family Oxydesmidae.

Sterna finely coriaceous, sparsely hirsute along the posterior slope, otherwise naked.

Process of sixth segment hirsute distad on its posterior face; the shape of the process would be nearly square but for the triangular apiculus.

Legs of males sparsely hirsute, the anterior and their sterna more strongly so, with longer hairs; the last two joints are distinctly though minutely tuberculate on their ventral face, and all the hairs appear to rise from the fine granules.

Copulatory legs (Plate LVIII, figs. 1*d*–1*i*).

Color of alcoholic specimens bright chestnut, the anterior subsegments, carinae, legs and antennae somewhat lighter; the basal part of the compressed portion of the copulatory legs is dark brown, as are also the apex of the last segment and the setiferous tubercles of the preanal scale.

Length, 70 mm.; width, including carinae, 12.5 mm.; width, without carinae, 8.5 mm.; length of antennae, 8 mm.; length of leg from tenth segment of male, 10 mm.; length of last leg of male, 7.5 mm.

*Locality*.—Tanga, Usambara, German East Africa, two mature males and one female, collected by Reimer. The female is more delicate in texture and had probably moulted shortly before being captured, but is evidently mature. A fourth specimen, a robust and deeply colored mature male, has recently come to the Berlin Museum from "Tanga Hinterland," collected by Heinsen.

A comparison of the measurements of the legs and antennae of this species with those of *Aulodesmus* and *Astrodesmus* will make apparent the much slighter development of secondary sexual characters, perhaps correlated with the absence of the process from the fifteenth segment and of ridges from the sterna.

#### TYMBODESMUS, new genus.

Body medium to rather large, somewhat more than five times as long as broad, oblong; dorsum rather strongly convex, the carinae somewhat horizontal.

Antennae filiform, moderately robust, second joint slightly longer than the four following, which are subequal; olfactory cones four.

First segment somewhat less than three times as broad as long, the anterior and posterior margins converging laterad, so that there is no lateral side but merely a rounded corner, much as in *Gomphodesmus*.

Segments dorsally smooth and shining, distinctly rugulose laterad.

Lateral carinae with thickened margins rather broad, prominent, and abrupt; on anterior segments the calli are somewhat reduced, but still prominent and distinct; posterior corners moderately produced.

Repugnatorial pores 13, located in large and deep excavations, opening subdorsally.

Preanal scale distinctly, though minutely, apiculate; setiferous tubercles rather small, though prominent, not exceeding the apex.

Sterna with a fine, though distinct, transverse ridge between the bases of each pair of legs; this is interrupted for a considerable distance in the middle and is more prominent between the posterior legs of each segment, especially segments 8 and 9, on the former of which it

is developed into a prominent, flattened process at the base of each leg as in *Astrodesmus luridus*.

Sternum of sixth segment of male with a subtrilobate process.

Sternum of fifteenth segment of male with a rounded triangular process from between the anterior pair of legs.

Legs of males moderately crassate; dorsal surface of second joint strongly inflated.

Anterior male legs with a distinct fleshy sole at the apex of the last joint.

Coxæ of second male legs with a subconic process distinctly notched on its ventral face.

Coxæ of second legs of female produced into subconic, divaricate processes as long as the second joint.

Sternum of third segment of female extended ventrally into a thin rim, which is broadly and deeply excavate in the middle to accommodate the coxæ of the second legs.

Copulatory legs scarcely trigonal, compressed nearly to base; node constricted at base, with a small spine on each side at the base of the flagellum, which is at base pressed against the basal part of the copulatory leg and is then curved cephalad and obliquely mesad, crossing its fellow.

The affinities of this genus are evidently with *Gomphodesmus* in the shape of the body and the form of the first segment, but it is distinct in the possession of the transverse ridges of the sterna and the process of the fifteenth segment. The copulatory legs are also strikingly different, not only from *Gomphodesmus* but from the other related genera, in that the flagella are not abruptly bent but make a simple curve obliquely cephalad, so that a lateral view gives a subelliptic outline.

From *Astrodesmus*, some species of which are strongly suggested by the processes of the sternum of the eighth segment as well as those of the sixth and fifteenth, it differs in the much more convex dorsum, narrower carinæ, and the narrowed and produced corners of the first segment, to say nothing of the differences displayed by the copulatory legs and the member of the olfactory cones.

#### TYMBODESMUS FIGLINUS, new species.

(Plate LVII, figs. 3a-3c.)

? *Eurydesmus mossambicus* PORAT, Bihang K. Sv. Vet., Akad. Handl., 1894, 20, IV, No. 5, p. 30; not PETERS, Reise nach Mossambique, 1862, V, p. 533.

Vertex without hairs, smooth and even; sulcus distinct, narrow, the suture deeply colored; obliquely transverse sulci indistinct.

Clypeus with a minute setiferous punctation on each side, somewhat below and slightly mesad from the antennal socket; a row of about 4 similar widely separated punctations, located nearer to the labral margin than to the antennal sockets.



Clypeus slightly concave laterad, the oblique lateral margins nearly straight, meeting the labral margin at a distinct corner: above the labrum with two transverse rows of closely set setiferous punctations.

Labrum nearly transverse, broken only by the incisions which define the three teeth, the median of which is much the largest and projects beyond the transverse edge of the labrum.

Antennæ filiform, rather robust, the joints distinctly obovate, the distal densely hirsute with fine hairs; the sixth joint is slightly longer than the fifth and equal to the third.

Gnathochilarium densely hirsute with short hairs.

First segment subsymmetrical, except that the posterior margin is broadly emarginate medianly; laterad the margins converge evenly to a narrow, rounded corner; the marginal callus very short, about as broad as on other segments, and narrowed abruptly into the distinctly raised edges of the anterior and posterior margins.

Segments dorsally smooth, polished and shining, slightly rugulose on the carinæ.

Lateral carinæ with distinct raised margins in front and behind; marginal calli very prominent, narrow in front, very broad behind, on middle and posterior segments produced more and more; only on the first few segments are the posterior corners of the carinæ right angles.

Repugnatorial pores facing latero-dorsad, located in rather deep depressions in the middle of the calli, which are there distinctly broader than on poreless segments.

Below the carinæ the segments are rugulose; poriferous segments have a distinct prominence below the insertion of the carinæ, doubtless indicating the location of the repugnatorial gland.

Anterior subsegments smooth and shining, the transverse sulcus distinct, crenulate; supplementary margin rather short.

Penultimate segment very short; exposed portion equal to about one-quarter of the preceding; carinæ small, rather broad.

Last segment very short, triangular; apex rather broadly truncate, rather thick.

Anal valves with margins distinct, but not strongly compressed and not very prominent, somewhat exceeded by the apex of the last segment; surface of valves scarcely convex, rugulose.

Preanal scale rugulose, subsemicircular; setiferous tubercles distinct, abruptly projecting beyond the posterior margin, but not exceeding the acutely apiculate apex.

Sterna sparsely hirsute with long hairs on the posterior slope, otherwise naked; the posterior of the transverse ridges is more prominent except behind segment 15.

Coxæ of second legs of male with a rounded conic ventral prominence, the base of which is dark colored, the apex white and apparently fleshy; the seminal aperture lies in the posterior face of this and is surrounded by a raised rim.

Process of segment 6 densely hirsute distad; the apex prominent, rounded, nearly as large as the prominent shoulders, below which the process is distinctly narrowed.

Seventh segment with posterior rim of aperture very deeply, broadly, and abruptly excised, leaving two sharply angled, thin processes, one at the base of each of the normal legs.

Process of segment 15 constructed exactly as in the other large genera, such as *Astrodesmus*; rounded at apex and distinctly canaliculate medianly to near the apex.

Legs of male hirsute with long hairs, the anterior more hirsute than the posterior and somewhat more crassate, the ventral face of the four distal joints tuberculate; the fleshy soles of the first six pairs are well developed, with the claws much reduced.

Copulatory legs (Plate LVII, figs. 3a-3c.)

Color of alcoholic specimen pale grayish brown, the posterior margin of each segment with a very narrow transverse band of deep brown; legs and antennæ pale. The specimen may not have reached its full coloration after having molted.

Length, 50 mm.; width, with carinæ, 9.8 mm.; without carinæ, 6.2 mm.; length of antennæ, 7.6 mm.; of leg from segment 10, 9.3 mm.

*Locality*.—Mundame, Kamerun; a single male specimen collected by Conradt is in the Berlin Museum.

#### TYMBODESMUS VIDUA, new species.

Another Kamerun specimen, possibly a female of the preceding species, is much more convex than the last and has the terminal segments more exposed. The carinæ are proportionally much narrower and the calli are so tilted that the pores face nearly laterad. The coxæ of the second pair of legs are produced into long conic-cylindric, pointed, and divaricate processes; the ventral rim of the third segment is deeply and broadly emarginate, as in the genus *Gomphodesmus*.

Length, 53 mm.; width, with carinæ, 10.4 mm.; without carinæ, 7.5 mm.; length of antennæ, 7 mm.; of leg from segment 10, 7.5 mm.

Color distinctly darker than that of the male specimen.

Whether this is in reality the female of *figlinus* can not be determined until the Kamerun region has been more thoroughly explored. For the present I am inclined to treat it as distinct on the ground that the much greater convexity of the body and the lateral position of the pores are differences greater than known to exist between the sexes in the present family, and minor differences in the conformation of the first and last segments seem to support the supposition of specific distinctness. The anterior segments are even more strongly convex than the others, and the first, while narrowed at the lateral angle, as in *figlinus*, is broader farther laterad, so that the final convergence of the sides is more abrupt than in the other specimen. From above the marginal calli appear much narrower than in *figlinus* on account of being turned

laterad, there being in reality no appreciable differences when closely compared, except in the much narrower carinæ of the female specimen.

*Locality*.—Barombi Station, Kamerun Colony. Berlin Museum.

Which, if either, of the preceding two species is that referred to by Porat can not be determined with certainty from his brief remarks:

“Kamerun, Kitta: Sjöstedt; 4 specimens.”

“The specimens from Kamerun are of smaller size, 60 mm. long, 10-11 mm. broad; the males have, nevertheless, between the first pair of legs of segment 6 and on segment 15 the peculiar processes which Peters has indicated, and his description applies very well to the above individuals, so that the identity is established beyond doubt. Our specimens are, however, uniformly yellow, probably bleached in alcohol. Peters gives the color as dark reddish brown, with yellow carinæ, legs, and antennæ.”

After an examination of Peters's type of *mossambicus* it appears equally certain that the Kamerun specimens do not represent that species. As may be seen by a comparison of the descriptions of the larger forms, the processes of segments 6 and 15 may coexist with a considerable variety of other characters, while the greater part of the remainder of Peters's extended description will apply to any member of the Gomphodesmida, it being, of course, impossible that differential characters could be selected in the description of the first member of what is probably a group of considerable extent.

A recent opportunity of examining fresh specimens of *mossambicus* in the Hamburg Museum shows that that species is in reality deep red in color, while all Kamerun specimens yet known are yellow.

#### TYMBODESMUS FALCATUS (Karsch).

(Plate LVII, figs. 4a-4c.)

*Eurydesmus falcatus* KARSCH, Troschel's Archiv. f. Naturgesch., 1881, p. 43.

*Tyccdesmus falcatus* (KARSCH) COOK, Proc. U. S. Nat. Mus., 1895, XVIII, pp. 92, 93, pl. III, figs. 15, 16.

Smaller and less convex than *T. figlinus*.

Vertex smooth and even, without hairs; the sulcus slight; the suture distinct, not colored; head otherwise as in *figlinus*, except that inferior corners are somewhat more rounded.

Antennæ filiform, rather slender, the joints not so strongly obconic nor so densely hirsute; the sixth joint not exceeding the fifth and slightly shorter than the third; the last joint is proportionally somewhat larger than in *T. figlinus*.

First segment subelliptic, with a distinct lateral side; less convex and proportionally somewhat longer than in *T. figlinus*; the lateral convergence of the sides is considerably less, and the lateral side is not produced and rounded, but has a distinctly longitudinal marginal callus and nearly straight lateral edge. The marginal callus is distinctly narrower than in *T. figlinus*, and the posterior edge is scarcely emarginate in the middle.

Segments 2 to 4 with lateral margins straight or slightly emarginate; in the other species they are slightly rounded.

Segments dorsally slightly uneven, rugulose laterad and upon the carinae.

Lateral carinae tilted somewhat horizontally out of the curve of the dorsal arch; anterior and posterior raised margins scarcely distinct; marginal calli moderately prominent, but distinctly less so than in *T. figlinus*, and less distinctly defined, especially upon anterior segments; lateral edge of carinae rather thin, distinctly thinner than in *T. figlinus*; posterior corner increasingly produced on all segments after the first, and prominent also there.

Repugnatorial pores facing more laterad than dorsad, located in distinct depressions which on account of their lateral position cause the edge of the carinae to appear slightly emarginate when viewed from above; poreless segments have the lateral edge considerably thinner, as the callus is distinctly narrower.

Anterior subsegments smooth and shining, the sulcus distinct, scarcely crenulate.

Penultimate segment very short, only a narrow edge exposed; carinae hidden under those of segment 18.

Last segment short, the apical projection broader, less distinctly triangular, by reason of the more curved sides, and somewhat more broadly truncate than in *T. figlinus*.

Anal valves rugulose, convex mesad, the margins not prominent, scarcely distinct, considerably exceeded by the thickened apex of the last segment; setiferous tubercles scarcely prominent.

Preal anal scale broader than a semicircle, evenly rounded, the apex rounded, only slightly projecting; setiferous tubercles submarginal, very small, scarcely projecting; surface even.

Sterna nearly naked except near the posterior margin, behind the posterior pair of ridges, which are much more pronounced than the anterior, except on segments 15 to 18.

Coxae of second legs with a rounded-conic prominence proportionally as large or larger than that of *T. figlinus* and similarly formed.

Process of segment 6 hirsute distad, the apex prominent, rounded, larger, and more projecting than the rounded shoulders; coxae of the sixth pair of legs with a large rounded hirsute prominence projecting apparently to fit against the anterior side of this process.

Seventh segment with posterior rim of aperture deeply excised as in *T. figlinus*, the excision rather deeper, with the lateral sides somewhat oblique, so that the mesial corners of the remaining laminate processes on each side are not so acute, but are nearly a right angle.

Process of segment 15 small, rather sharply triangular, somewhat flattened dorso-ventrad, but proportionally much thicker than in *T. figlinus*, especially in the middle where that of *T. figlinus* is canaliculate.

Legs of male slightly less crassate than in *T. figlinus* and somewhat

less densely hirsute; ventral face of four distal joints with minute tubercles; fleshy soles of last joint of pairs 1 to 6 moderately developed.

Copulatory legs (Plate LVII, figs. 4a-4c).

Color of alcoholic specimen pale grayish brown, the carinae, legs, and antennæ sordid; the whole animal bleached in alcohol so that the darker contents of the alimentary canal show through. Karsch gave the color as uniform pale testaceous in 1881.

Length, about 40 mm.; width, 7.2 mm.; length of antenna, 7 mm.; of leg of tenth segment, 7.5 mm.

*Locality*.—Seriba Ghattas, Djur, in the upper valley of the White Nile (Bahr-el-Ghazal region); a single male specimen preserved in alcohol in the Berlin Museum was collected by Dr. Schweinfurth. The bottle (No. 629) contains also a fragment consisting of segments 12 to 20 of what was evidently another specimen of the same species.

This species was referred provisionally to the genus *Tycodesmus* on account of its size and habit, the characters from which the genus might be more accurately determined not being given in the original description.

*Tymbodesmus falcatus* differs from *T. figlinus* in the following important characters which may indicate generic distinctness, although the form of the copulatory legs is good evidence that the two are more nearly related to each other than to any known third. *T. falcatus* is less than half as large as *T. figlinus*, the segments, legs, and antennæ are more slender and delicate, the dorsum is less convex, the lateral thickenings of the carinae are less prominent dorsally, but are turned sidewise more than in any other form here described, so that the poriferous depressions face nearly laterad and cause the carinae to appear emarginate when viewed from above; the processes of the sterna of the sixth and fifteenth segments are small, narrow, and not medianly sulcate. They are both rounded triangular in outline, that of the sixth segment having no lateral lobes or shoulders, which are strongly developed in *T. figlinus*. The sterna of segments 8-10 have the posterior pair of ridges increased into flattened knobs, while in *figlinus* even the produced pair of the eighth segment are thin and sharp at apex. The copulatory legs in *falcatus* have the node very prominent laterad and proportionally much larger than in *figlinus* and occupying the entire sinus of the curve; in *T. figlinus* the upper part of the sinus is open, the node is strongly constricted at base and bears sharp teeth on its median and lateral faces, the homologous prominences of *T. falcatus* being, as far as they can be distinguished at all, mere rudiments in comparison.

#### Genus AULODESMUS Cook.

*Aulodesmus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 83.

Body very large, five times as long as broad, tapering slightly caudad; dorsum strongly convex, the carinae decurved in the direction of the dorsal arch. Antennæ filiform, second joint longest, the next four

subequal, the fourth slightly longer than the third or fifth, sixth only slightly shorter than fifth; olfactory cones four.

First segment three times as long as broad, posterior margin distinctly curved forward, so that the segment is laterally much shorter than in the middle. Segments dorsally even and smooth, neither granular nor areate.

Lateral carinae with thickened margins distinct, twice as broad on poriferous segments, distinctly narrower on posterior segments than on anterior; margins not expanded, not broader on segments 1 to 4 than on segment 6; posterior corners of carinae slightly produced, increasing caudad from the fifth segment; anterior and posterior edges of carinae very narrowly or faintly margined.

Repugnatorial pores 13, located in shallow cavities.

Preanal scale minutely apiculate, the setiferous tubercles distinct, close to the apex but not exceeding it.

Sterna with a distinct, transverse, medianly interrupted ridge between bases of each pair of legs.

Sternum of sixth segment of male with an oblong, minutely apiculate process between the bases of the anterior pair of legs.

Sternum of fifteenth segment of male with a broadly triangular ensiform process projecting cephalad between the anterior pair of legs.

Legs of male moderately crassate, dorsal face of second joint inflated, anterior six male legs with a small fleshy apical sole, the claw reduced.

Second male legs with coxae moderately produced into a blunt cone.

Copulatory legs as described for *Omodesmus*, but the two spines described in *Omodesmus* are subequal and there is another smaller spur located at the base of the mesial spine and directed mesad; the flagellum is bent laterad beyond the lateral spine, and makes nearly two turns in a diffuse spiral; its apex lies between the bases of the copulatory legs and not upon the nodus as in *Astrodesmus*.

The sixth antennal joint is distinctly longer in proportion to the fifth than in *Astrodesmus*, and the antennae as a whole, as well as the individual joints, are somewhat more slender than in that genus.

Repugnatorial pores appear much smaller in this genus than in *Astrodesmus*, where they are located in large cavities.

The process of the fifteenth segment is accommodated by a depression very slight in comparison with that of *Astrodesmus*.

As remarked under *Omodesmus*, there is great similarity between the copulatory legs of it and *Aulodesmus*, while those of *Astrodesmus*, though constructed on the same plan, offer several differences from both. The mesial and lateral spines are almost rudimentary in *Aulodesmus*, the flagellum, though it rises similarly from the anterior (by flexure posterior) face of the node, does not coil spirally, but is bent back upon itself and then turns mesad so that its bidentate apex lies against the node of its fellow. A small spine, perhaps homologous with the spur-like process described for *Omodesmus*, arises in *Aulodesmus* from the proximal

end of the mesial face of the node and is directed cephalad (by flexure ventrad or caudad) against the side of the compressed proximal part of the structure.

In *Aulodesmus*, moreover, the sternum of the sixth segment behind the process is hollowed out to accommodate the copulatory legs. This is not accomplished, as in some cases, by an excavation in the chitinous exoskeleton, but by the omission of that part of it which would interfere with the copulatory legs, so that the ventral part of the sixth segment is very short and broadly sinuate posteriorly to a much greater degree than in the two other genera under comparison.

The segments, including the carinæ, are evenly convex dorsally, the most conspicuous irregularity being a distinct, though gradual and not strongly pronounced, prominence or rather a general inflation of the surface at the base of the carinæ.

Notwithstanding the general similarity in habit between this genus and *Astrodesmus*, some differences may be pointed out. *Aulodesmus* is distinctly the larger and heavier of the two, and the dorsum is decidedly more convex when the same sexes are compared, the convexity not being due to a mere difference in the tilt of the carinæ, but resulting from a different curve of the dorsal arch. In *Aulodesmus*, too, the body is distinctly, though slightly and gradually, narrowed caudad from near the middle, while it is scarcely narrowed anteriorly to the second segment. In *Astrodesmus* the body is not appreciably narrowed to the ends, which are both very abrupt.

The small carina at the base of the posterior leg of each segment is much more pronounced than in *Astrodesmus*.

The legs of males are distinctly more crassate than in *Astrodesmus* and their two basal joints especially are densely hirsute, while in *Astrodesmus* the hairs are comparatively scattering. The copulatory legs of *Aulodesmus* are also much more densely hirsute and with longer hairs.

#### AULODESMUS MOSSAMBICUS (Peters).

(Plate LVIII, figs. 2a-2c.)

*Polydesmus mossambicus* PETERS, Monatsber. d. K. Preuss. Akad. d. Wiss., Berlin, 1855, p. 81.

*Eurydesmus mossambicus* PETERS, Reise nach Mossambique, Zoologie, 1862, V, p. 533.

*Aulodesmus mossambicus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 88, pl. III, figs. 17, 18; pl. VI, figs. 1-3.

Vertex without hairs, smooth and shining; sulcus distinct, ending between the sockets in a considerable depression.

Clypeus smooth and even, except two small and irregular (perhaps accidental) depressions near the middle, and the usual oblique, lateral excavations.

Antennæ sparsely hirsute.

Gnathochilarium densely hirsute with short hairs.

First segment with anterior margin straight, the posterior slightly and broadly emarginate in the middle, curved cephalad on each side; posterior corners somewhat greater than a right angle, rounded; a distinct lateral margin continuous in front nearly to the middle of the segment, posteriorly broader and becoming obsolete at the posterior corner; the segment is evenly convex in general contour, the carina not being tilted as in *Omodesmus*.

Segments 2 to 4 with lateral margins distinct and continuous along the anterior edge, but not on the posterior; their carinae not tilted out of the general dorsal curve, though the anterior corner of the second segment, like that of the first, is strongly decurved.

Segments dorsally nearly even, the surface even and shining, faintly coriaceous or rugulose under a lens; on posterior segments very nearly obsolete granules in transverse rows can be traced under a lens.

Lateral carinae about one-fourth as wide as the body cavity; thickened margins distinct, continued in fine ridges on the anterior and posterior edges, twice as broad on poriferous as on the other segments; marginal callus of fifth segment broadest, the pore located nearer to the mesial edge than to the margin and somewhat behind the broadest part of the callus, which is distinctly narrowed caudad; on other segments except the seventh the callus is as broad opposite the pore as elsewhere and tapers almost equally to both ends.

Below the carinae the segments are more or less rugulose and with a distinct prominence at the middle of the base of the carinae; as this prominence does not appear on poreless segments, it is probably correlated with the presence of the repugnatorial gland.

Above the base of the posterior leg of each segment is a distinct longitudinal row of granules or secondary carina.

Anterior subsegments faintly rugulose-punctate under a lens.

Penultimate segment with the apices of the rather short carinae sometimes equaling or slightly exceeding the posterior corners of the eighteenth.

Last segment with the exposed basal portion rather long; the projecting triangular part broad, the apex rather broadly punctate, the setiferous punctations not located on tubercles.

Anal valves vertically rugulose, especially below; the setiferous tubercles small; the margins thin and prominent, not greatly exceeded by the apex of the last segment.

Preanal scale rugulose; the setiferous tubercles distinctly conic, projecting somewhat ventrad, scarcely equaling the minutely apiculate apex.

Sterna densely hirsute with long hairs, especially on the posterior slopes of the very prominent transverse ridges.

Process of the sternum of the sixth segment somewhat longer than broad, quadrate, with a small median apiculus; the process is rather densely hirsute with short hairs, except the apiculus; antically the



process is medianly carinate, while postically it has two median depressions, one above and the other below the middle.

Sternum of fifteenth segment with a broadly triangular, medianly excavate process consisting of an extension of the transverse ridge between the anterior pair of legs, directed cephalad and accommodated by a small concavity in the fourteenth segment. The ridge connecting the anterior pair of legs of the sixteenth segment is continuous, while all others are medianly interrupted. On the segments immediately following the copulatory legs the ridges are short, and those between the posterior pair of legs are much more prominent than those between the anterior.

Legs of males densely hirsute with long hairs on the ventral face of the two basal joints; especially is this the case in the anterior half of the body; distal joints of legs also densely hirsute with shorter hairs; the ventral faces of the distal joints of the legs are scarcely hirsute and slightly, if at all, tuberculate.

Copulatory legs (Plate LVIII, figs. 2a-2c).

Color: According to Peters the dorsum and antennæ were dark reddish brown, the carinæ, ventral surface, and legs brownish yellow.

Length, 83 mm.; width, including carinæ, 15 mm.; width of body cavity, 10 mm.; length of antenna, 11.5 mm.; length of leg of ninth segment, 15 mm.

*Locality*.—Dr. Peters says: "I found this species in rubbish heaps on the island of Mozambique and on the peninsula of Cabaceira in the month of December, at Querimba in May, and also at Tette." The specimen chiefly employed in the above description was collected by Peters at Mozambique and labeled as type in Peters's handwriting. It is No. 544 of the Berlin Museum. The specimens which Peters supposed were young males with well-developed copulatory legs are members of a distinct genus, here described under the name *Neodesmus juvenis*. Whether the specimens collected at other places belong in reality to the present species may perhaps be doubted.

#### MERODESMUS, new genus.

Body of medium size, about five times as long as broad, tapering gradually cephalad, very abruptly caudad; dorsum strongly convex, the carinæ strongly depressed in the direction of the dorsal arch.

Antennæ filiform, the second joint slightly longer than the four following, which are subequal; olfactory cones 10.

First segment about three times as broad as long; posterior margin nearly straight, the anterior strongly curved laterad so that there is no distinct lateral edge, the posterior corner of the segment being more pronounced than in the other genera.

Segments dorsally even and smooth.

Lateral carinæ rather narrow, their thickened margins of moderate width and prominence, the anterior and posterior edges very narrowly margined; the calli of poreless and anterior segments are narrow,

though distinct; they taper gradually from the posterior corner of the carina to its raised anterior edge; posterior corners moderately produced on posterior segments.

Repugnatorial pores 13, located in rather small depressions facing somewhat laterad.

Preanal scale scarcely apiculate, the apex considerably exceeded by the rather large setiferous tubercles, which are so close together that the slopes of their bases nearly meet.

Characters of mature males unknown.

Female with coxæ of second legs produced into two long cylindrical processes, which exceed the second joint of the legs in length and are densely hirsute with very long hairs.

The type of this genus is *M. compactilis* Gerstäcker. The processes are so remarkable and, as far as known, so unique a character that they may with safety be made the basis of a generic diagnosis. That we are not, however, dealing with an entirely anomalous condition may perhaps be inferred from the fact that the female of *Gomphodesmus* has the coxæ somewhat conically prominent. In that case, however, the posterior margin of the third segment is below much produced into a thin prominent rim, which is medianly broadly and deeply emarginate. In *Merodesmus* no such tendency appears, and the form and sculpture of the carinae of the first segment are different not only from *Gomphodesmus*, but from other Gomphodesmidæ, to say nothing of the discrepancy of olfactory cones between the two genera compared. The general outline of the very short, strongly convex, and compacted body, which tapers distinctly cephalad, is also peculiar. The carinae are proportionally narrow, and are inserted below rather than above the middle line of height.

#### MERODESMUS COMPACTILIS Gerstäcker.

(Plate LXI, fig. 2a.)

*Eurydesmus compactilis* GERSTÄCKER, Decken's Reise, 1873, III, 2, p. 519.

*Anlodesmus compactilis* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 91.

Body short and stout, proportionally strongly arched, slightly shining.

Vertex with a fine, though sharp, median furrow; clypeus below more strongly contracted than in *A. latus*, the curved line above the middle of the margin distinct, the part below densely punctate.

Antennæ somewhat more slender than in *Astrodesmus latus*.

First segment with anterior margin even, moderately areolate, passing with the same curve into the lateral margins; posterior edge emarginate in the middle and also on each side, so that the lateral corners are sharp and slightly produced caudad; marginal ridges smooth, linear, continued on the anterior margin and gradually narrowed.

Subsequent segments strongly arched dorsally. Second to fourth segments with an evident emargination on each side of the posterior edge.

Lateral carinae small, below the middle height of the segments; on

the anterior segments scarcely evident, but more pronounced from the fifth back, slightly arched, the posterior edge slightly more elevated. Marginal ridges of segments 2 to 4, also of 6 and 8, linear, more pronounced than on the first segment. Carinæ gradually larger from segment 10; from 14 with evident tooth-like projections beyond the posterior margin. Projection of segment 18 smaller than that of 17, that of 19 small, blunt, papilliform.

Last segment with a distinct, fine, transverse furrow limiting the posterior caudal projection, which is short triangular, with a blunt, almost truncate, dorsally swollen apex, and has on each side a stout, wartlike knob. Both the knobs and the apex of the segment bear bristles.

Anal valves light gray, with smooth yellow margins. Preanal seale transversely subhexagonal, with a small median knob between the lateral wart-like prominences.

Second leg of the female with a long styliform process directed obliquely caudad and ventrad, and lying between the legs of the third pair.

Color in alcohol pale bone-yellow, with a light-brown posterior margin of the dorsal portion of the segments, and with more or less evidently brown posterior corners of the anterior and posterior carinæ. Antennæ and legs light ferruginous.

Length, 49 mm.; width, 10.5 mm.

*Locality*.—One mature female specimen and an immature male, collected at Mombassa.

The male specimen was 31 mm. long and 8 mm. broad, and had 19 segments. There was no trace of the button-like process of the coxa of the second leg, which bears the genital opening, nor of the processes of the pedigerous laminae of the sixth and fourth from the last pairs of legs. In place of the not yet developed genitalia, between the coxæ of the legs of the seventh segment were two transversely quadrate cushion-like prominences.

#### Genus SPHENODESMUS Cook.

*Sphenodesmus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 83.

Body rather small, over five times as long as broad; dorsum moderately convex, the moderately broad carinæ sloping nearly in the direction of the dorsal arch.

Antennæ filiform, rather robust, second joint slightly longer than the four following, which are subequal; olfactory cones ten.

First segment scarcely three times as broad as long, subelliptic, the posterior margin laterally somewhat curved forward.

Segments evenly convex, distinctly coriaceous rugulose, especially laterad.

Lateral carinæ with marginal callus very prominent, continuous in front, scarcely so behind; on anterior segments the callus is less prom-

inent and narrower, and does not appear on the first segment—that is, the raised margin is not specially thickened laterad; posterior corners of carinae thick, rounded, subrectangular to the middle segments, behind which they are slightly and gradually more produced.

Repugnatorial pores 13, located in distinct excavations behind the middle of the posterior subsegments.

Preanal scale subsemicircular, the setiferous tubercles smaller and not equaling the distinct apiculus.

Sterna without transverse ridges.

Sternum of sixth segment of male with a broad, rounded, apiculate process.

Sternum of fifteenth segment unmodified.

Legs of males scarcely crassate; dorsal face of second joint rather slightly inflated; legs 1 to 6 with a very small fleshy sole at apex, their claws not greatly reduced.

Coxæ of second male legs produced into a long, stout papilla, of which the posterior face is flattened and contains the seminal aperture.

Copulatory legs strongly decurved and with large nodes, as in the large genera *Astrodesmus* and *Aulodesmus*; the mesial spine at the base of the flagellum is very long; the flagella are rather stout, strongly flexuous, cross each other, and are accommodated in a large cavity considerably in front of the aperture in which the copulatory legs are inserted. The anterior edge of this aperture is produced ventrad into a prominent rim, not noticed in other genera.

#### SPHENODESMUS RUGULOSUS Cook.

(Plate LIX, figs. 1a-1c.)

*Sphenodesmus rugulosus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 83.

Vertex without hairs, polished and shining; sulcus distinct, not deep; as also the interantennal suture.

Clypeus smooth and evenly convex, a curved transverse row of about six minute setiferous punctations below.

Antennæ sparsely hirsute with short hairs, more numerous on the distal joints.

First segment subelliptic, more regular in outline than in the larger forms of the present family; dorsally smooth and even, the carinae distinctly and equally margined, the margin more distinct laterad, not abruptly, so that a marginal callus, as it appears on the other segments and on other genera, may be said to be wanting; dorsally the carinae are distinctly concave and rugulose; the margins do not extend more than halfway to the median line.

Second segment with a distinct lateral side, the anterior corner somewhat prominent.

Segments dorsally smooth, finely coriaceous, or sparsely punctulate in the middle; laterad and on the carinae distinctly rugulose; posterior segments are also rugulose along their posterior margin.

Lateral carinæ less than one-fourth as wide as the body cavity, inserted not much above the middle of the side; marginal callus prominent, continuous along the anterior edge as a distinct raised margin, the calli of poreless carinæ about half as wide as the others; anterior carinæ with the margins nearly straight, the middle rounded, the others with the posterior corner gradually, but not strongly, produced.

Repugnatorial pores 13, located in distinct excavations which open more nearly laterad than dorsad.

Anterior subsegments polished and shining; transverse constriction distinct, not crenulate; below the carinæ minutely rugulose; secondary carinæ obsolete.

Penultimate segment short, its minute carinæ not equaling those of the eighteenth segment.

Last segment subtriangular, distinctly truncate at apex.

Anal valves somewhat rugulose; margins distinct, moderately prominent, not strongly compressed; setiferous tubercles very small.

Preanal scale broadly rounded, triangular; setiferous tubercles minute, though distinct, exceeded considerably in size by the distinct, rather blunt, apiculus.

Sterna moderately hirsute with long hairs which are more numerous along the posterior margin and on anterior segments; no distinct sternal ridges; an indistinct transverse sulcus.

The sternal process of the sixth segment subsemicircular, faintly shouldered, and distinctly apiculate, hirsute along its edges with long hairs.

Legs of males probably slightly crassate, moderately hirsute with long hairs, especially on the inferior face of the basal joints.

Copulatory legs (Plates LIX, figs. 1a-1c).

Color of alcoholic specimen rather dark chestnut brown; marginal calli and under side somewhat lighter; antennæ and distal joints of the legs dark, like the dorsum.

Length, about 24 mm.; width, with carinæ, 4.2 mm.; without carinæ, 2.75 mm.; antennæ, 3.5 mm.; length of leg from middle segment, 3.5 mm.

*Locality*.—Ravirondo, East Africa. A single male specimen in a bottle with *Harmodesmus nitens* and *Mychodesmus macramma*.

The lateral angle of the first segment suggests that of *Gomphodesmus*, being evenly rounded, with no implication of a lateral side, but there is a distinct difference in the wide marginal callus of *Gomphodesmus* which occupies the whole apex of the lateral angle. In *Sphenodesmus* the angle is less pointed and the raised margin is scarcely more pronounced laterally than elsewhere.

This species presents the most pronounced dorsal sculpture yet known in the present family, the upper surface of the carinæ being densely rugulose, while in all other cases the sculpture is much fainter and more irregular in appearance, as though accidental.

## SIGODESMUS, new genus.

Body rather small, nearly five times as long as broad; dorsum moderately convex, the carinae decurved nearly in the direction of the dorsal arch.

Antennae filiform, second joint longest, joints 3 to 5 subequal, distinctly longer than joint 6; olfactory cones ten.

First segment less than twice as broad as long, subsemicircular, the anterior margin being carried around in an even curve to the posterior corner, which is distinctly angled.

Segments dorsally smooth, rugulose laterad.

Lateral carinae distinctly margined in front, scarcely so behind; marginal callus distinct, narrowed in front, very narrow on poreless segments, very short and narrow on the first, and passing insensibly into the raised margin; posterior corners of all segments somewhat produced, those of the posterior segments increasingly so, but not as narrow and spiniform as on some of the larger genera.

Repugnatorial pores 13, located in distinct excavations facing nearly dorsad.

Preanal scale rounded triangular, distinctly angled but not apiculate; setiferous tubercles small, distinct, rather close together, not exceeding the apex.

Sterna with transverse ridges distinct, but not prominent, much as in the smaller species of *Astrodesmus*.

Sternum of segment 6 with a subtriangular process which has a distinct, rounded apiculus; it is slightly shouldered and has a broad base as in *Astrodesmus*.

Sternum of segment 7 with posterior rim of copulatory aperture expanded, entire.

Sternum of segment 15 with a very broadly triangular, small process which fits into a deep excavation in the posterior part of the sternum of segment 14.

Legs of male moderately crassate, proportionally about as long as in *Astrodesmus*; dorsal face of second joint much inflated; fleshy sole of first six pairs rather large, the claw much reduced.

Coxae of second legs of male broadly produced.

Copulatory legs constructed somewhat as in *Astrodesmus*, the basal hairy part compressed, not trigonal, narrower and longer than in *Astrodesmus*; from the mesial side of the base of the nodus arise two large spines not present in *Astrodesmus*; one of these is directed somewhat mesad and crosses its fellow while the other is turned laterad; the flagellum is moderately stout, crosses its fellow, and ends in two stout prongs.

From *Astrodesmus* the form of the first segment and copulatory legs render diagnosis easy. The difference in size is also very great, except in the case of *A. petilis*, from which it is distinct in the more compact

and robust body, the shorter legs and antennæ, the semicircular first segment, and the large spines of the copulatory legs.

The five species which are associated under the present name may not prove to be a natural group, but if they do not belong together it seems unlikely that they can be located under any of the preceding genera.

ANALYTICAL KEY TO THE SPECIES OF SIGODESMUS.

Length, 47 mm.; flagellum ending in a thickened node-like expansion from which projects a single curved prong: *Sigodesmus monocerus*, p. 724.

Length, 40 mm., or under; flagellum ending in two distinct, slender, or at least pointed, prongs.....

Length, 40 mm.: flagellum ending in two strongly curved, connivent prongs, the longer of which is strongly recurved near the apex and has a sharp tooth near its base: *Sigodesmus ruspolti*, p. 725.

Length, less than 30 mm.: prongs not so strongly connivent, the longer not recurved at apex, and without a tooth at base.....

Flagellum without other processes than the terminal prongs, one of which is over twice as long as the other: *Sigodesmus indigus*, p. 723.

Flagellum with a small lateral process below the base of the more robust of two prongs, which are subequal in length.....

Lateral process mentioned above very small, acute, and spiniform: *Sigodesmus contortus*, p. 725.

Lateral process subrectangular, nearly as wide as the flagellum opposite the process: *Sigodesmus innotatus*, p. 726.

SIGODESMUS INDIGUS, new species.

(Plate LIX, figs. 2a-2c.)

Vertex without hairs, strongly convex, suture and sulcus distinct.

Clypeus with two minute setiferous punctations between the antennal sockets, somewhat closer to each other than to the sockets; another pair of similar punctations lower down and wider apart; supralabral punctations few and indistinct.

Antennæ rather sparsely hirsute with short hairs, the sixth joint distinctly shorter and slightly thicker than the fifth.

First segment without a trace of an anterior corner, the anterior margin being carried around to the posterior corner almost in a semicircle; the posterior corner is more distinctly angled than in any other member of the family here described, and the great length of the segment is also peculiar; the marginal callus is narrower than in any of the genera which have a lateral angle.

Segments dorsally finely coriaceous, somewhat rugulose on the carinæ.

Lateral carinæ of moderate width, distinctly narrower than in *Astrodesmus*; anterior margin much more distinct than the posterior; marginal callus narrowed in front and broadened opposite the pore, so that the poriferous carinæ are more rounded than the others; the carinæ of segments 17 to 19 are rather broad, much shorter and broader than in *Astrodesmus petilus*.

Segment 19 nearly concealed, its carinae small and rounded, exceeded by those of segment 18.

Last segment (abnormally?) very broad and rounded, the apex not produced nor truncate, somewhat exceeded by the margins of the anal valves.

Anal valves with margins scarcely distinct, not compressed nor prominent; setiferous tubercles distinct, the superior pair somewhat at the side of the margin instead of upon it; surface of anal valves and preanal scale faintly rugulose.

Sterna sparsely hirsute with long hairs on the posterior slope, otherwise nearly naked.

Sternum of segment 6 with process nearly naked, the mesial prominence of the basal joints of the sixth pair of legs with long hairs.

Sternum of segment 15 with process very broadly triangular, pointed, scarcely canaliculate.

Legs of male moderately hirsute, the anterior somewhat more densely than the others.

Copulatory legs (Plate LIX, figs. 1a-1c).

Color of alcoholic specimen pale bone yellow.

Length, 28 mm.; width, 6 mm.; without carinae, 4.3 mm.; length of antennae, 5 mm.; of leg from tenth segment, 6 mm.

*Locality*.—A single male specimen in the Berlin Museum was collected by Denhardt at Witu, British East Africa.

#### SIGODESMUS MONOCERUS, new species.

(Plate LIX, figs. 3a, 3b.)

Differs from the preceding in the much greater size and somewhat more robust habit.

The copulatory legs, while clearly more similar to those of *S. indigus* than to any other species, are strikingly distinct in the shorter and more robust flagellum, the longer prong of *S. indigus* being replaced by a thickened, rounded prominence. The other prong is here somewhat larger and more strongly curved than in the other species. Of the two large teeth opposite the node of *S. indigus*, the shorter is here rudimentary, while the other is much smaller than in that species.

Color of fresh alcoholic material light grayish brown on carinae and anterior subsegments, the posterior half of the posterior subsegment being also light dorsally; the anterior half, and especially a large but somewhat irregular and mottled patch at the base of the carina, dark brown; this darker marking is usually well defined and sometimes very conspicuous. The transverse sulcus, at least, is dorsally very dark brown, with a dark median line and a lateral patch on the anterior subsegment at the height of that of the posterior subsegment, but smaller, lighter, and poorly defined.

Length of male, about 47 mm.; diameter, 11.5 mm.; length of antenna, 9 mm.; of leg of tenth segment, 10 mm.



*Locality*.—One male and two female specimens are in the Berlin Museum from Tarn, vicinity of Mombasa, collected by F. Thomas.

This species was compared with the type of *Astrodesmus luridus* (Karsch), also from Mombasa, but the two are, without doubt, distinct, and the basal remnants of the copulatory legs of *luridus*, which are robust and close together, render it certain that that species has nothing to do with those arranged under *Sigodesmus*, although in *S. monoceus* the process of the sixth segment has a distinct distal margin and a small, abruptly rounded apiculus, much as in *Astrodesmus luridus*.

#### SIGODESMUS CONTORTUS (Pocock).

*Eurydesmus contortus* POCOCK, Ann. and Mag. Nat. Hist., 1896, 6th ser., XVII, p. 436, pl. XVIII, fig. 4.

*Type*.—British Museum.

*Locality*.—Mkonumbi, region of Mount Kenia, East Africa.

Length, 25 mm.; width, 5 mm.

This species agrees with *indigus* in size and habit and in the armature of the sterna of the male. The copulatory legs agree, moreover, in that the flagellum divides distad into two large prongs, but from the single drawing given by Mr. Pocock it appears that the two spines which arise near the node are more nearly equal in size and length than in *S. indigus*. Were the habitat the same, one would be inclined to look upon *S. innotatus* as a synonym of this species, on account of the close approximation in the shape of the distal part of the flagellum.

#### SIGODESMUS RUSPOLII (Silvestri).

*Autodesmus ruspolii* SILVESTRI, Ann. Mus. Civ. Genoa, 1896, XXXVII, p. 59, fig. 1.

Color fusco-testaceus, antennæ and legs reddish.

First segment short, rounded in front, laterally margined and with the angles acute.

Preanal scale with the sides arcuate and the apex truncate, armed with three large tubercles, of which the lateral bear long hairs.

Sternum of segment 6 armed with a large, broad, upright process, somewhat rounded at apex and beset with long hairs.

Ninth pair of legs armed at base with a rather small, obtuse process.

Sternum of segment 15, with a rather long, triangular, acute process directed cephalad.

Copulatory legs at the base of the flagellum with three arcuate processes shorter and less attenuate [than in *S. innotatus*]; flagellum at apex with two connivent processes, of which the longer is not pointed and is provided near its base with a rather large tooth.

Length, 40 mm.; width, 10 mm.

*Locality*.—Ueb, Somaliland.

The above is a translation of Silvestri's description with the omission of characters common to all the representatives of this family. It was based on a male specimen collected by Prince Ruspoli and preserved in the Genoa Museum.

This and the following species were placed by Silvestri in the genus *Aulodesmus*, but the distribution, size, and especially the structure of the copulatory legs, seem to indicate much greater affinity with *Sigodesmus*, the only genus which has three spines at the base of a two-pronged flagellum.

SIGODESMUS INNOTATUS (Silvestri).

*Aulodesmus innotatus* SILVESTRI, Ann. Mus. Civ. Genoa, 1896, XXXVII, p. 59, fig. 2.

Color throughout testaceous and somewhat cinereous; antennæ and legs concolorous or reddish. Preanal scale with the sides slightly rounded and the apex truncate; armed with three large tubercles, of which the external bear each a long seta.

Sternum of segment 6 with a subrectangular upright process somewhat narrowed at apex and beset with setæ.

Ninth pair of legs at base with a very small obtuse process.

Sternum of segment 15, with a rather small, triangular, acute process.

Copulatory legs with three long, slender processes surrounding the base of the flagellum, which has at apex two prongs of subequal length, of which the longer is more robust and less pointed. The more slender process has a prominent acute angle at base, and below the terminal prongs is a small rectangular process.

Length, 28 mm.; width, 6 mm.

*Locality*.—Magala Re Umberto, Somaliland. Specimens collected by Prince Ruspoli are in the Genoa Museum.

The above description is translated and abridged from that of Silvestri.

It would seem, from a comparison of the figures, that the generic affinities of this species are not with *Aulodesmus*, but that it is very closely allied, if not identical, with *S. contortus*, which was published in June, 1896, while *innotatus* appeared in November of the same year. The shape of the distal part of the flagellum is at least closely alike, *S. contortus* being represented with the basal angle of the smaller tooth more rounded and the subapical process more pointed than in *S. indigus*.

Genus ASTRODESMUS Cook.

*Astrodesmus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 83.

Body very large, about five times as long as broad, cavity scarcely depressed; oblong, abruptly narrowed at both ends.

Labrum scarcely emarginate, with three short, blunt teeth.

Antennæ filiform, joints in order of length 2, 4, 5, 3, 6, 1, 7. Seventh joint broader than long, truncate, and with a conic depression in its apical face; ten olfactory cones arranged in a circle around the edge of the depression.

Mandibular stipe with exposed surface divided by sutures into five areas, the basal larger than all the others together.

Hypostoma strongly areolate; rising from each side of the convex median portion is a flattened, oblong process lying against depressions of the lower part of the mentum.

Cardo present, transversely oval.

Mentum broadly triangular, long-pointed in front, very broadly emarginate behind, hirsute.

Stipes over twice as long as broad (2:5), hirsute.

Lingual laminae three times as long as broad, hirsute. Lingual lobes large. Median lobe not evident.

First segment three times as broad as long, with anterior and posterior margins medianly straight and parallel; posterior margin laterally curved forward; anterior corners broadly rounded, the posterior nearly a right angle. The segment is much broader than the head, very slightly narrower and noticeably longer than the second segment.

Segments with dorsal surface smooth, neither granular nor areolate.

Lateral carinae subapproximate, about one-fourth as wide as the body cavity, inserted about three-fourths of the distance up; margin abruptly raised and thickened above, especially the lateral; edge blunt, entire; carinae of anterior segments curved slightly forward, the posterior with posterior corners more and more produced.

Repugnatorial pores small, dorsal, located in a slight depression of the middle of the thickened margins of the lateral carinae of segments 5, 7, 9 to 19, surrounded by a fine raised rim.

Penultimate segment very short, included between the projecting corners of the antepenultimate.

Last segment very short, triangular, the apex narrow, truncate or rounded, the whole segment bearing 16 setae, as follows: Two pairs lateral, two pairs marginal, two pairs dorsal; all these upon larger or smaller tubercles; one pair apical and one subapical, these last rising from punctations.

Anal valves with compressed, elevated margins and two setigerous tubercles, the upper placed on the outer slope of the raised margin, the lower somewhat removed from it.

Preanal scale semielliptic-triangular, tricuspidate, the three projections close together, the middle flat, the others conic, blunt, with piliferous punctations at apex.

Sterna with a sharp, transverse, medianly interrupted ridge between the bases of each pair of legs; between the ridges a transverse furrow.

Sternum of sixth segment of male with a three-cornered process projecting ventrad between the anterior pair of legs.

Sternum of the fifteenth segment of male with a broadly ensiform process projecting cephalad from between the anterior pair of legs into a socket in the posterior part of the fourteenth.

Eighteenth segment with the pedigerous laminae very narrow, especially the posterior, so that the legs project obliquely caudad over the preanal scale.

Legs of males long and crassate, the dorsal face of the second joint

strongly inflated; all the joints more or less tuberculate on the ventral face and beset with bristles on the apical joints.

First six pairs of male legs with a fleshy sole at apex of the last joint, the claw shortened.

First pair of legs of male six-jointed like the others; the coxæ long, approximate.

Second pair of male legs with the coxæ produced ventrad into a large process, in the depression of the flattened ventro-posterior face of which is the seminal opening.

Male genitalia with basal joint very small, flattened; distal joint very large, laterally compressed, tricarinate; unguinal portion very long, complicate, thin and compressed at base to form a flexible pseudo-articulation, above which it is inflated, then extended into a long flexuous flagellum, very slender distally.

#### ANALYTICAL KEY TO THE SPECIES OF ASTRODESMUS.

Body large and robust (65 mm. by 13.5 mm.); dorsum strongly convex, distinctly rugulose to the naked eye, especially on the carina; marginal calli prominent and broad, that of the fifth segment strongly arcuate mesad, being greatly widened to accommodate the large poriferous cavity: *A. tauga*, p. 736.

Body much smaller or smooth and shining; marginal calli moderately developed, the poriferous merely oval, those of the fifth not so different from those of the seventh segment.....

Body rather small and slender (33 mm. by 6.5 mm.); antennæ and legs slender, equal in length to the width of the body; transverse ridges of sterna slightly developed; process of sternum of segment 15 very small, tuberculoid: *A. petilus*, p. 733.

Body larger and more robust; antennæ and legs more robust, not equaling in length the diameter of the body; transverse ridges of sterna distinct; process of segment 15 large and strongly chitinized.....

Process of sternum of segment 6 subquadrate, the sides being subparallel and the distal margin nearly transverse, except for a small median apiculus; two distinct, flattened processes between the bases of posterior pair of legs of segment 8: *A. luridus*, p. 734.

Process of sternum either subtriangular or narrower near the base than farther up, and with a large median projection, so that there is no transverse distal margin; segment 8 with the ridges of the sternum scarcely larger than the others.....

Body very robust (55 mm. by 14.5 mm.); the dorsum but slightly convex; the carina broad and fitting closely together: *A. robustus*, p. 731.

Body not more than 13 mm. in diameter by the above length; dorsum more convex, the carina distinctly separated.....

Copulatory legs slightly or not at all expanded, or at least entirely unarmed immediately below the slender terminal spine: *A. latus*, p. 731.

Copulatory legs distinctly and abruptly flattened and expanded below the terminal spine; proximal corner of expanded portion produced into a distinct, recurved spine.....

Size about 45 mm. by 11.5 mm.; dorsum distinctly rugulose striate longitudinally; expanded subterminal portion of copulatory legs short, the proximal spine short: *A. striatus*, p. 733.

Size at least 55 mm. by 12.5 mm.; dorsum not rugulose longitudinally, appearing smooth to the naked eye; expanded subterminal portion of copulatory legs longer and thinner, the proximal spine longer (see Plate LX, fig. 1c): *A. stellifer*, p. 729.

## ASTRODESMUS STELLIFER Cook.

(Plate LX, figs. 1a-1k.)

*Astrodesmus stellifer* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 86, pl. II, figs. 1-2; pl. III, figs. 1-9.

Vertex without hairs, polished and shining; sulcus distinct, meeting a transverse shallow sulcus (and suture) between the antennal sockets.

Clypeus smooth, even, excepting an oblique depression on each side and a few coarse punctations below.

Antennæ with basal joints very sparsely hairy, the distal gradually more hirsute.

Mentum hirsute over the posterior two-thirds of its surface.

Stipes densely hirsute, a broad depression along the lateral edge.

Lingual laminae very densely hirsute over their entire surface.

Segments dorsally apparently smooth, shining with a dull luster; uniformly covered with minute, irregular, indistinct, impressed lines and wrinkles, and very minutely and densely punctate. Posterior margins of all the segments more or less rough with fine longitudinal notches or very short wrinkles.

Anterior segments with the posterior subsegments slightly convex anteriorly in the middle; broadly emarginate on each side of the convexity.

Lateral carinae about one-fourth as wide as the body cavity; margin abruptly raised and thickened above, the edge entire, blunt; anterior and posterior edges of carinae with a distinct, though fine, raised margin, which does not extend across the segments. Anterior carinae laterally curved slightly forward, the posterior corners at first right angles, gradually more produced, until on posterior segments the rounded projection is more than half as long as the posterior subsegment. On posterior segments the raised margin is gradually broader, until on the penultimate it occupies the entire carina.

Below the carinae the segments are densely rugulose with fine, flexuous wrinkles; a small, subtuberculate, indistinct carina just above the insertion of the legs.

Anterior subsegments shining, very indistinctly marked with longitudinal impressed lines.

Last segment very short, triangular, the apex narrow, truncate, slightly rounded; superior lateral tubercle somewhat above the level of the carina of the nineteenth, the inferior somewhat below; the anterior tubercle near the sinuation, the posterior about halfway between the anterior and the apex. The dorsal bristles close to the margin; apical piliferous punctations rather close together, the subapical somewhat farther apart; apex of segment thick.

Anal valves moderately inflated, with compressed, elevated margins; rugulose, especially in the depressions.

Prenal scale with surface nearly smooth.

*Sterna sparsely hirsute.*

Process of the sternum of the sixth segment somewhat quadrate in posterior view, narrower at base, then broader, then narrowed again to a mucronate apex. The apical faces hirsute with very long hairs. Posteriorly the process, and the sternum below it, is medianly deeply canaliculate; antically the process is straight, with fine, raised lateral margins.

Sternum of the fifteenth segment with the process naked, broadly ensiform, medianly grooved below. The process consists of an extension of the transverse ridge between the anterior pair of legs, and is directed cephalad into a depression between the posterior legs of the fourteenth segment. Between the posterior legs of the fifteenth segment is also a similar depression, but smaller, although the sixteenth sternum is in no way modified.

Legs of males hirsute with long bristles, especially on the distal joints. Tubercles confined to the ventral face and best developed on the fifth joint; on the posterior legs the tubercles of the other joints are small or rudimentary. Posterior legs more slender than the others, but not much shorter.

First legs of males with the sole less developed and the claw larger than on the five following legs.

Male genitalia (Plate LX, figs. 1c-1i).

Color in alcohol varying from dirty yellowish-white (bone color) to dark purplish brown. The carinae are always light, and the posterior margin of the posterior subsegment usually so, also the anterior subsegments, excepting a dark median line and a line on each side along the level of the carinae. Posterior subsegments bordered all around with a fine margin of distinct brown. Legs and antennae reddish-brown, especially the distal joints. First segment usually with a broad margin of light color all around.

Length, 65 mm.; width, 13 mm.

*Type*.—U. S. National Museum collection. Four mature males.

*Locality*.—Tana River, East Africa, between the coast and Hameye.

One aspect of the male genitalium of this species greatly resembles that of *Eurydesmus larus* Gerstäcker, as figured by Karsch, and the first inclination was to identify it with that species in spite of considerable discrepancies in Gerstäcker's description. These are, however, too grave to be reasonably ignored. Compared with most Polydesmoidea, the animal would be called very robust, instead of slender. Gerstäcker's measurements, however, justify his statement. Neither is it loosely articulated nor slightly convex. The apex of the process of the sixth segment of the male is not a distinct knob, and the shape of the process does not suggest a spherical triangle. The process of the fifteenth segment is not on the "fourth from the last" pair of legs, but the eighth from the last, though in this respect it would not be surprising if a mistake has been made in the description.

## ASTRODESMUS ROBUSTUS, new species.

(Plate LX, fig. 2a.)

With general habit of *A. stellifer*, but distinctly more robust, and less convex than any of the other species. The carinae also fit very closely together, and assist in giving the animal a somewhat characteristic appearance.

The copulatory legs resemble those of *A. laxus*, and differ from those of *A. stellifer* in that the flagellum lacks the retrorse subapical spine and lamellar expansion.

Color like some of the browner specimens of *S. stellifer*.

Length of male, 55 mm.; width, 14.5 mm.

*Locality*.—East Africa, probably from the German colony; but more particular data are not at hand, and the type specimen of the Berlin Museum is not now accessible.

## ASTRODESMUS LAXUS (Gerstäcker).

(Plate LXI, figs. 1a-1d.)

*Eurydesmus laxus* GERSTÄCKER, Deeken's Reise, 1873, III, 2, p. 518.

*Aulodesmus laxus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, pp. 90, 91.

Vertex hairless and smooth, the sulcus very shallow.

Clypeus smooth and even, excepting an oblique depression on each side, and a few coarse punctations below.

Antennae with basal joints very sparsely hairy, the distal gradually more hirsute.

Segments dorsally smooth and even, finely rugulose on the carinae.

Lateral carinae with the anterior and posterior margins moderately pronounced, the marginal calli distinctly and more abruptly broader on anterior segments, and the posterior corners moderately produced.

Repugnatorial pores in broad, shallow depressions, quite different from the smaller and distinctly deeper ones of *A. stellifer*.

Segment 18 much more exposed than in the other species of the genus. This character is shared by the other posterior segments, so that the body appears to taper more gradually caudad; carinae are of the usual size, but project considerably beyond those of segment 18.

Last segment with projecting portion distinctly narrow, rather broadly truncate, separated by a transverse sulcus.

Sterna densely hirsute on the posterior slopes of the not very strongly pronounced transverse ridges; process of sixth segment moderately hirsute laterally and upon its posterior face.

Legs of male moderately crassate and hirsute, both of these characters being more pronounced on the anterior.

Copulatory legs (Plate LXI, figs. 1a, 1b).

Length, about 62 mm.; width, 12.3 mm.; length of antenna, 9.5 mm.; of leg from middle segment, 12 mm.

*Locality.*—The type was a single male specimen from Mombassa. Subsequently this species has been reported from various other places in that region. It is without doubt congeneric with *A. stellifer*, the type of the genus, the habit, secondary sexual characters, and copulatory legs being closely the same.

The copulatory legs, compared with those of the specimen from Dar es Salaam (Stuhlmann), show several appreciable differences. The basal spurs of the node are much more pronounced. Those of the mesial face are situated close together at the apex of a long, subconic process. The distal spine of the node of *laxus* is smaller than that of Stuhlmann's specimen, while the lateral corner opposite is pointed in the type and rounded in the other.

The process of the sixth segment is broader and stronger than in the type and has the distal corners somewhat prominent, while that of the type is triangular, longer than broad, the lateral margins merely convex. The process of the fifteenth segment is somewhat longer and more pointed in the Dar es Salaam specimen, and the marginal calli are throughout somewhat broader and more prominent. The first segment is longer in the type and is more decidedly shortened laterad, the posterior margin being carried more obliquely forward. The depressions in which the pores are located are shallower in the type.

The preanal scale has a distinct, small and rounded, subconic apex, though the contrary might be inferred from Gerstäcker's description.

The wart-like prominences which Gerstäcker ascribes to the basal joints of the posterior legs seem to be merely the usual small granules which appear at the bases of the hairs of this and other families.

The terminal knob which Gerstäcker ascribes to the process of the sixth segment does not appear on his type. The apex of the process is as usual somewhat thickened and the point blunt, but in this specimen the apex distinctly tapers both in breadth and thickness.

The process of segment 15 is in its proper place, not on the fourth pair of legs from the last, as Gerstäcker states.

Gerstäcker gives the length as 78 mm., but this is certainly a mistake. The specimen is strongly curled at both ends, so that exact measurement is difficult, but his type is certainly less than 65 mm., 62 mm. being a careful estimate.

On the label of the type specimen in Gerstäcker's handwriting the locality is given as Sansibar, while in his published description it stands as Mombassa. Dr. Karsch informs me that this may not be a contradiction, as specimens were usually specially indicated which came from the island. The material, however, from any one locality is still so small that it is difficult to estimate the value of the minor differences noted, and some of the characters of the type specimen, such as the form of the last segment, may easily be the result of accident.

The species can be distinguished at once from *stellifer* by the somewhat more slender body and the more narrow and pointed process of



the sixth and fifteenth segments. The spine which stands at the base of the flagellum in front is much smaller than in *stellifer*, while the flagellum is provided with a sharp, proximally directed spine at the base of the small subapical expansion which appears in both species.

The Berlin Museum possesses a considerable number of specimens closely comparable with that collected by Stuhlmann at Dar es Salaam. These are labeled "*Zwischen der Küste und Kilimandscharo*" (Höhnel); "*Madinula*;" "*Tana*" (Neumann).

ASTRODESMUS STRIATUS, new species.

(Plate LXI, fig. 3a.)

In habit and coloration resembling *A. stellifer*, but smaller, and differing from that and all other species in having the dorsal surface of the segments distinctly striate longitudinally in addition to being somewhat strongly rugulose.

Copulatory legs most closely similar to those of *A. stellifer*, but with the distal expansion and its attendant spines somewhat shorter than in that species. The stout spine at the base of the flagellum is larger than in *A. stellifer*, though scarcely equal to that of *laxus* and *robustus*.

Length of male, about 45 mm.; width, 11.5 mm.

*Locality*.—East Africa; type in the Berlin Museum.

ASTRODESMUS PETILUS, new species.

(Plate LXI, figs. 6a-6d.)

Vertex evenly convex, the sulcus rather shallow, the suture without hairs.

Glypeus with a pair of widely separated punctations somewhat below the antennal sockets, and several others above the labrum.

Antennæ filiform, slender, the distal joints moderately hirsute with short hairs.

First segment with marginal callus distinctly longitudinal, as on the following, there being a distinct lateral side.

Segments dorsally finely rugulose-coriaceous, more distinctly so upon the carinæ.

Lateral carinæ with distinct anterior and posterior margins; marginal callus with mesial edge nearly straight; on poriferous segments the callus is widened laterally, so that the carinæ appear more rounded than on the poreless segments.

Repugnatorial pores rather large, facing dorso-laterad, placed in a shallow depression and surrounded by a fine raised rim; the widening of the callus opposite the pore is sometimes rather abrupt, so that the edge behind it appears slightly emarginate.

Below the carinæ the segments are finely rugulose with distinctly tuberculate secondary carinæ.

Anterior subsegments very finely coriaceous; transverse constriction distinctly crenulate; supplementary margin of moderate length; the

spaces between the minute striæ at the base of the supplementary margin are produced into small, broad, regular teeth.

Penultimate segment short, the carinæ narrow and spiniform, not exceeding those of segment 18.

Last segment with projecting portion rather narrow, triangular, truncate; the seliferous tubercles are distinct, though small.

Anal valves with distinct, compressed, moderately prominent margins; surface of anal valves and preanal scale slightly rugulose.

Sterna rather sparsely hirsute; the ridges, which are prominent and distinct elsewhere in *Astrodesmus*, are here almost rudimentary, but the sterna are prominent between the bases of the legs, these broad ridges being separated by a transverse depression.

Sternum of segment 6 more hirsute than the others with long hairs, the process also hirsute, subtriangular in form, not so strongly apiculate and shouldered as in other species, and with a very broad sloping base which extends nearly to the sockets of the legs.

Sternum of segment 7 with rim of copulatory legs not produced at the base of the normal legs as in *A. stellifer*.

Sternum of segment 15 with process shaped much as in *A. stellifer*, but smaller.

Legs of male long and slender, the anterior slightly stronger than the posterior and more densely hirsute, the last two joints tuberculate on the ventral face.

Copulatory legs (Plate LXI, figs. 6b-6d).

Color of alcoholic specimen pale bone yellow with traces of a darker color dorsally.

Length, 33 mm.; width, 6.5 mm.; without carinæ, 4.5 mm.; length of antenna, 6.5 mm.; of leg from sixth segment, 7 mm.; of leg from tenth segment, 6.5 mm.

*Locality*.—A single male specimen, collected by Fischer at Zanzibar, is in the Berlin Museum.

This similarity of the copulatory legs seems to indicate a close relationship with *stellifer*, from which there is, however, great distinctness in size, habit, and proportionally much longer and more slender legs.

The ridges or secondary carinæ above the bases of the legs are very prominent in this species and are beset with papilliform tubercles much as in some *Oxydesmidæ*. It seems probable that these prominences are of use in supporting the creature when it rests, and they are probably correlated with the dorsal prominence of the second joint of the legs, which probably lies against them.

#### ASTRODESMUS LURIDUS (Karsch).

(Plate LXI, figs. 4a, 4b.)

*Eurydesmus luridus* KARSCH, Troschel's Archiv f. Naturw., 1881, p. 43.

*Astrodesmus luridus* COOK, Proc. U. S. Nat. Mus., 1895, XVIII, p. 88.

Segments somewhat more convex than in *A. stellifer*, especially the anterior; their surface smooth, somewhat uneven and rugulose laterad.

and somewhat inflated at the base of the carinæ, a character which is strongly developed in *Aulodesmus* and only slightly in *Astrodesmus stellifer*.

First segment less broadly emarginate in the middle of the posterior edge; the form, slope, and margins are closely similar to those of *A. stellifer*.

Lateral carinæ slightly narrower than in *A. stellifer*, the posterior corners of posterior segments slightly less produced, the rounded anterior corners slightly more prominent.

Preanal scale less narrowed toward the apex, the setiferous tubercles not so close.

Sterna even more sparsely hirsute, the transverse ridges less prominent.

Process of sternum of sixth segment subquadrate, slightly broader at base and the distal angles more rounded; the process is minutely apiculate in the middle of the straight distal edge; the apiculus is small and weak compared with the thickened apex of the same structure in *A. stellifer*, where there is no transverse distal edge and the lateral corners project beyond the sides of the process below.

Sternum of fifteenth segment with process short and broad, the corresponding depression of the fourteenth segment very slight.

Sternum of eighth segment with the transverse ridges of the posterior pair of legs short (narrow) and produced to be nearly as high as broad; the corresponding ridges of *A. stellifer* are also prominent but not produced.

Legs of male moderately hirsute, about as in *A. stellifer*; they are slightly more slender proportionally than in that species, but the inflation of the dorsal face of the second joint is distinctly greater.

Copulatory legs broken at the base of the ungual portion; the remaining basal part of the second joint is shaped closely like that of *A. stellifer* and is slightly broader.

Color, according to Karsch, dirty testaceous; carinæ testaceous yellow; also a large subdisciform spot on the posterior margin of cariniferous segments, strongly narrowed at the sides. From the specimen it would appear that the yellow spot is rather subrescentic, occupying nearly half of the posterior subsegment in the middle and tapering off on each side to the base of the carina. The legs were evidently dark red, as in *A. stellifer*.

Length, 48 mm.; width, 10.5 mm.

*Locality*.—Mombassa. The typical and only specimen is a male collected by Hildebrandt and belonging to the Berlin Museum, No. 802.

The color pattern of this species is not essentially different from that of *A. stellifer*, which has the carinæ yellowish and the posterior part of the segments sometimes with an oblique light band, and this, if developed, would have the shape of the spot described for *luridus*.

On account of the broken antennæ and copulatory legs the generic reference of this species is not made with confidence. It possesses

characters in common with *Tycodesmus* in the emargination of the posterior rim of the aperture in which are inserted the copulatory legs and in the development of distinct processes at the bases of the last pair of legs of the eighth segment, but these processes are distinctly flattened, not conical as in *Tycodesmus*; the emargination of the rim of the copulatory aperture is much less than in *Tycodesmus medius*. With the partial exceptions just noted, the secondary sexual characters are those of *Astrodesmus*. The process of the sixth segment is even wider than in the other species of *Astrodesmus*, in striking contrast to the very slender process in *Tycodesmus*.

ASTRODESMUS TANGA, new species.

(Plate LXI, fig. 5a.)

Known only from the female; similar, but not closely related to *A. stellifer*, in that the body is larger and more robust, and the segments distinctly more convex dorsally; the carinae of the first segment, though not sharp, are distinctly more produced and pointed than in *A. stellifer* and have the marginal callus much shorter; the calli of poriferous segments are distinctly broader and shaped much as in *Aulodesmus mossambicus*; the carinae of posterior segments much more distinctly produced caudad, the corners sharp and spiniform; the dorsal surface is rather uneven, distinctly and rather densely rugulose laterad and on the carinae; the last segment is more robust and more broadly truncate. Legs longer and more robust, and the secondary carinae distinctly more prominent than in the other species of *Astrodesmus*.

Color of alcoholic specimens very dark olive brown; the carinae, legs, and antennae yellowish.

Length, about 65 mm.; width, including carinae, 13.5 mm.; without carinae, 9.5 mm.; length of antennae, 8 mm.; of leg of tenth segment, 9 mm.

*Locality*.—Tanga, Usambara, German East Africa, the type a female specimen collected by Reimer, in the Berlin Museum, where there is another entirely similar female from the same region.

As the body cavity of males of *Astrodesmus stellifer* measures only about 8 mm. it is evident that in the present species the body is heavier at the expense of the carinae, as the total measurement is more nearly the same. Such a difference might be expected in females, but not to so great an amount, and a female referred to *stellifer* differs from the males to a much less extent in dorsal convexity, so that, together with the other differences enumerated, it is not impossible that the discovery of males may reveal characters which will compel the removal of the present species from *Astrodesmus*.

## EXPLANATION OF PLATES.

## PLATE LV.

*Harmodesmus nitens*, p. 686.

- Fig. 1a. Copulatory leg, lateral view.  
1b. Copulatory legs, posterior view.

*Marptodesmus chanleri*, p. 683.

- 2a. Third leg of male, posterior view.  
2b. End of last joint of same, more magnified to show the fleshy apical pad and the somewhat rudimentary claw.  
2c. Fifteenth leg of male, anterior view.  
2d. Ventral aspect of segments 6 and 7, showing the copulatory legs *in situ*.  
2e. Copulatory leg, lateral view.  
2f. Copulatory legs, posterior view.  
2g. Antenna.  
2h. Last four segments, lateral view.  
2i. Head and first three segments, dorsal view.  
2j. Last five segments, dorsal view.

## PLATE LVI.

*Uloodesmus micramma*, p. 690.

- Fig. 1a. Copulatory legs, anterior view.  
1b. Same, posterior view.  
1c. Same, lateral view.

*Mychodesmus macramma*, p. 693.

- 2a. Copulatory legs, anterior view.  
2b. Same, lateral view.

*Neodesmus juvenis*, p. 695.

- 3a. Copulatory legs, anterior view.  
3b. Same, posterior view.  
3c. Same, lateral view.

## PLATE LVII.

*Tycodesmus medius*, p. 699.

- Fig. 1a. Copulatory leg, anterior view.  
1b. Same, lateral view.  
1c. Same, posterior view.

*Omodesmus oxygonus*, p. 701.

- 2a. Last three segments, dorsal view.  
2b. Copulatory legs, anterior view.  
2c. Copulatory leg, posterior view.  
2d. Same, posterior-lateral view.  
2e. Same, lateral view.

*Tymbodesmus figlinus*, p. 708.

- 3a. Copulatory legs, anterior view.  
3b. Same, posterior view.  
3c. Same, lateral view.

*Tymbodesmus falcatus*, p. 711.

- 4a. Copulatory legs, anterior view.  
4b. Same, lateral view.  
4c. Same, posterior view.

## PLATE LVIII.

*Gomphodesmus castaneus*, p. 705.

- Fig. 1a. Head and first three segments, dorsal view.  
 1b. Segments 7 and 8, dorsal view.  
 1c. Segment and legs, posterior view.  
 1d. Copulatory legs, lateral view.  
 1e. Same, anterior view.  
 1f. Same, posterior view.  
 1g-1i. Same, different views of apex of flagellum, more magnified.  
 1j. Leg and process of sternum of segment 6, anterior view.  
 1k. Prenal scale.  
 1l. Antenna.

*Autodesmus mozsambicus*, p. 715.

- 2a. Copulatory legs, anterior view.  
 2b. Same, lateral view.  
 2c. Same, posterior view.

## PLATE LIX.

*Sphenodesmus rugulosus*, p. 720.

- Fig. 1a. Copulatory legs, anterior view.  
 1b. Same, posterior view.  
 1c. Same, lateral view.

*Sigodesmus indigus*, p. 723.

- 2a. Copulatory legs, anterior view.  
 2b. Same, posterior view.  
 2c. Same, lateral view.

*Sigodesmus monocerus*, p. 724.

- 3a. Copulatory legs, anterior view.  
 3b. Same, lateral view.

## PLATE LX.

*Astrodesmus stellifer*, p. 729.

- Fig. 1a. Diagrammatic view of the rudimentary eighth joint of the antenna, showing the ten olfactory cones.  
 1b. Third leg of male.  
 1c. Copulatory legs, anterior view.  
 1d. Same, posterior view, *in situ*.  
 1e-1i. Same, lateral and mesial views.  
 1j. Sternum of segment 6, anterior view, showing the median process and two basal joints of the legs.  
 1k. Posterior view of process of segment 6.

*Astrodesmus robustus*, p. 731.

- 2a. Copulatory legs, anterior view.

## PLATE LXI.

*Astrodesmus latus*, p. 731.

- Fig. 1a. Copulatory legs, anterior view.  
 1b. Same, lateral view.  
 1c. Carina, showing marginal callus and repugnatorial pore.  
 1d. Process of sternum of segment 6.

*Merodesmus compactilis*, p. 718.

Fig. 2a. Second pair of legs of female.

*Astrodesmus striatus*, p. 733.

3a. Copulatory leg, anterior view.

*Astrodesmus luridus*, p. 734.

4a. Process of sternum of segment 6.

4b. Two basal joints of second legs.

*Astrodesmus tanga*, p. 736.

5a. Carina, to compare with 1c.

*Astrodesmus petilus*, p. 733.

6a. Antenna.

6b. Copulatory legs, anterior view.

6c. Same, posterior view.

6d. Same, lateral view.